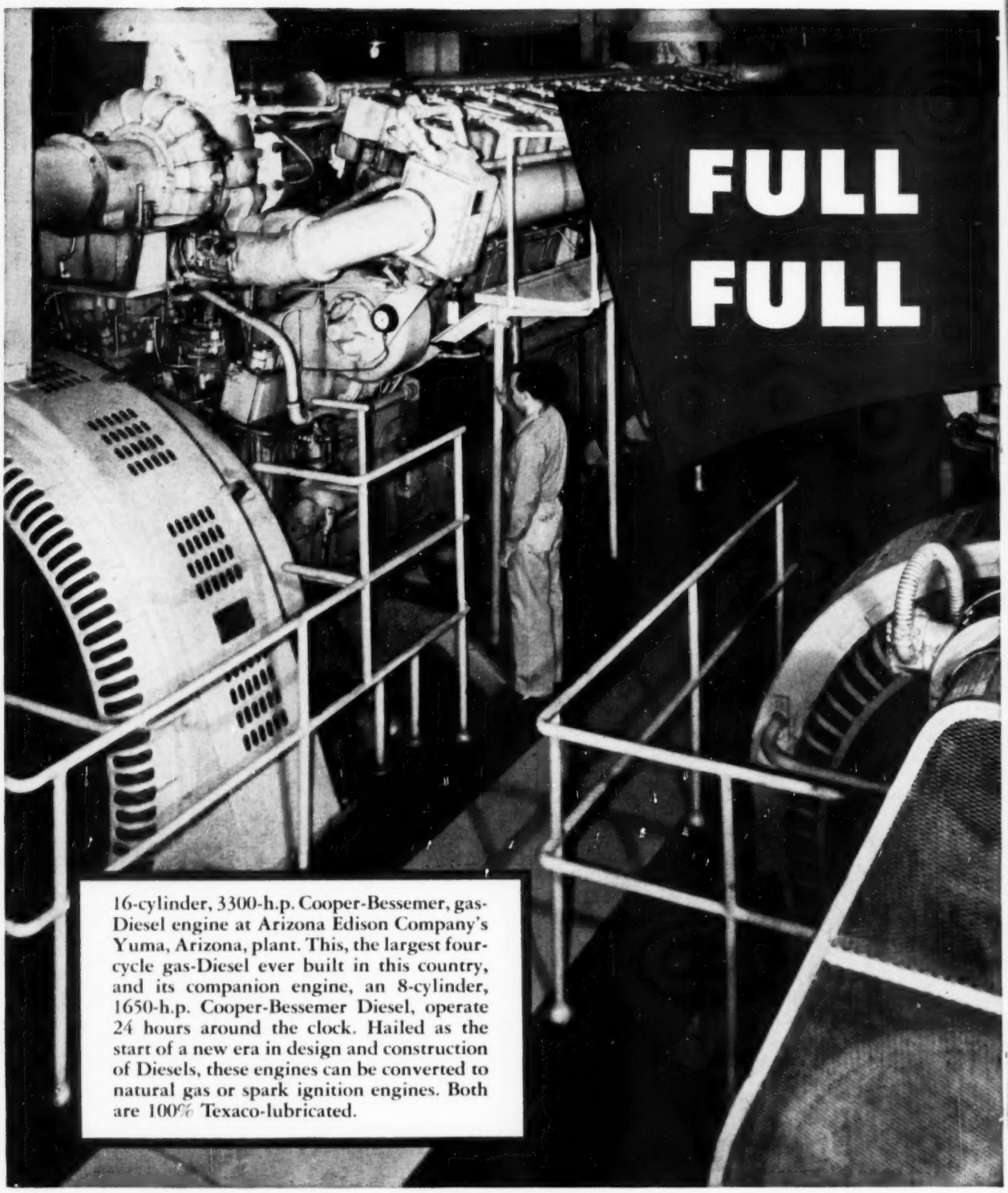
Diesel Power
& Diesel Transportation

Diesels in Highway Transportation

Our 29th Year

FEBRUARY, 1951



16-cylinder, 3300-h.p. Cooper-Bessemer, gas-Diesel engine at Arizona Edison Company's Yuma, Arizona, plant. This, the largest four-cycle gas-Diesel ever built in this country, and its companion engine, an 8-cylinder, 1650-h.p. Cooper-Bessemer Diesel, operate 24 hours around the clock. Hailed as the start of a new era in design and construction of Diesels, these engines can be converted to natural gas or spark ignition engines. Both are 100% Texaco-lubricated.

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

TEXACO

TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for February, 1951, Vol. XXIX, No. 2. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices 192 Lexington Ave., New York 16, N. Y. Subscription rates: United States, $3.00 per year; single copies 35¢; Canada $4.00; Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connesticut, under Act of March 3, 1879.

PROTECTION POWER...

...assured with TEXACO URSA OILS

LUBRICATE your engines—Diesel, gas or dual-fuel—with world-famous *Texaco Ursa Oils,* and you'll get full power with fuel economy. These fine oils keep your engines free from harmful carbon and sludge, keep rings free, ports open, and valves working properly. This means better compression and combustion.

Texaco Ursa Oils are especially resistant to oxidation and stand up under heat and pressure. They protect bearings from corrosion and assure longer life for all moving parts. You get trouble-free performance and lower maintenance costs.

Texaco Ursa Oils are available in proper viscosities for every need. Approved by leading Diesel manufacturers, they are easily America's No. 1 choice. In fact:

More stationary Diesel h.p. in the U. S. is lubricated with Texaco Ursa Oils than with any other brand.

A Texaco Lubrication Engineer will gladly help you in the proper and most economical selection of lubricants. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

You have no power problem when a **Petter Diesel** drives your product!

Petter Diesels from 3 hp to 36 hp are ideal for Compressor Drives, Pumping Units, Road Rollers, Tractors, Stone Crushers, Concrete Mixers, Saw Benches, Refrigeration Machinery, Generator Sets for marine or industrial duty, and virtually every application where a dependable source of economical power is required.

ASSURED AVAILABILITY

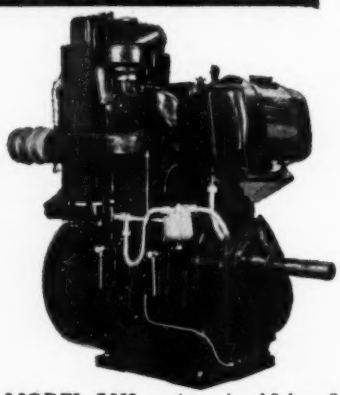
WORLD-PROVED DEPENDABILITY

ROCK-BOTTOM PRICES

PETTER *Water-Cooled* DIESELS

Petter water-cooled diesel engines are available in two basic 4-cycle models. Series AV–3 to 12 hp. Series B–12 to 36 hp. Thermo-syphon tank cooling or radiator. Hand or electric starting without difficulty, even under sub-zero conditions. Full-speed drive from either end or half-speed drive from timing-gear end except on B3 and B4 models. Aluminum alloy pistons and removable cast iron liners.

Type	HP Cont.	RPM	BORE In.	STROKE In.	LENGTH In.	WIDTH In.	HEIGHT In.	WEIGHT Lbs.
AV1	3/6	1000-1800	3.15	4.33	29.75	17.75	28.5	406
AV2	6/12	1000-1800	3.15	4.33	36.5	17.75	28.5	598
B2	12/18	1000-1500	4.33	4.33	43.5	21	37	939
B3	18/27	1000-1500	4.33	4.33	50.125	21	37	1218
B4	24/36	1000-1500	4.33	4.33	56.75	21	37	1478

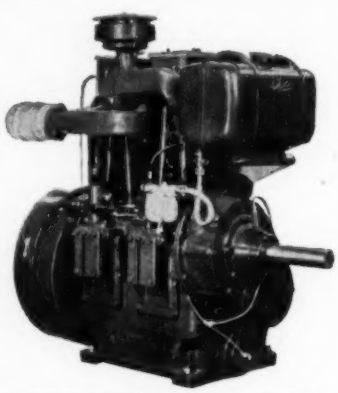


MODEL AV2 — 4-cycle, 12 hp, 2-cylinder, 1800 rpm, vertical, water-cooled industrial diesel engine.

PETTER *Air-Cooled* DIESELS

TYPE AVA–3 to 11 hp in 1 and 2-cylinder models. Air-cooled by flywheel fan and ducting over finned cylinders and cylinder heads. Light weight, low overall dimensions. Hand or electric starting. Full-speed drive from either end, or half-speed drive from timing-gear end. Totally enclosed, but easily accessible. Dependable operation under any climatic conditions. Direct injection with an open combustion chamber insures easy starting.

Type	HP Cont.	RPM	BORE In.	STROKE In.	LENGTH In.	WIDTH In.	HEIGHT In.	WEIGHT Lbs.
AVA1	3/5.5	1000-1800	3.15	4.33	29.75	20	29	390
AVA2	6/11	1000-1800	3.15	4.33	37.75	21	32	558



MODEL AVA2—4-cycle, 11 hp, 2-cylinder, 1800 rpm, vertical air-cooled industrial diesel engine.

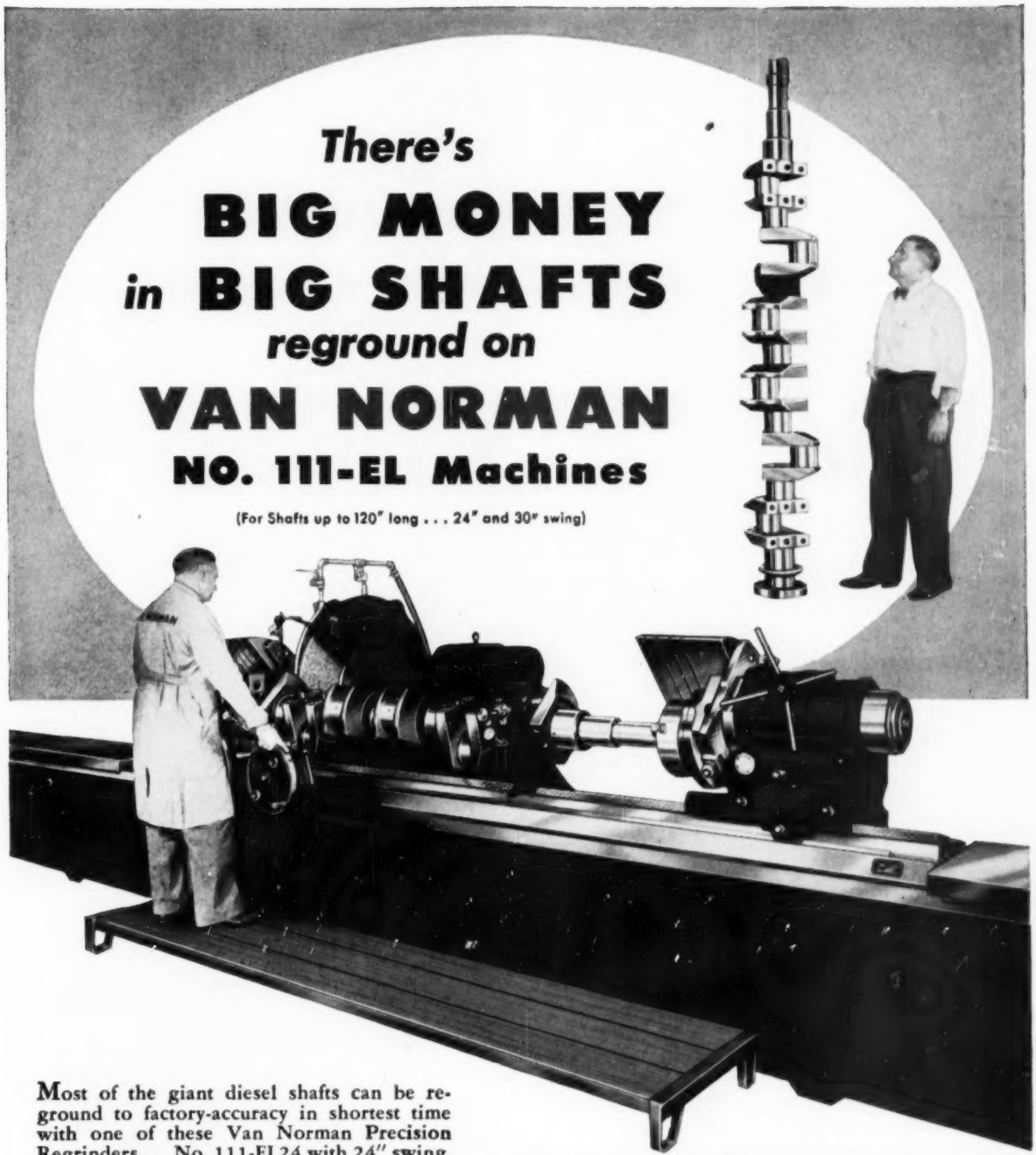
Throughout the world, in over 100 countries, Petter Engines, parts and service are available. This is an added advantage for you if your equipment is to be sent outside the United States. The Petter factory, one of the most up-to-date and efficient plants in the world, produces 1500 Petter Diesels every week. Engines are strategically stocked throughout the United States and a continuous supply is assured to meet your needs. Write for all the facts as to why Petter will serve your needs better.

Dealers:
Only a few choice territories still open. Act fast for this valuable franchise.

ABOE, Inc.
ABOE DIESEL
Empire State Building
350 Fifth Avenue
New York 1, N. Y.
Petter

There's BIG MONEY in BIG SHAFTS reground on VAN NORMAN NO. 111-EL Machines

(For Shafts up to 120" long . . . 24" and 30" swing)



Most of the giant diesel shafts can be reground to factory-accuracy in shortest time with one of these Van Norman Precision Regrinders . . . No. 111-EL24 with 24" swing, or No. 111-EL30 with 30" swing. Shaft shown on the No. 111-EL24 above is 103" long with a 10½" stroke, 6"-diameter mains and 5¼" pin journals.

Set-up and operation are quick and easy. And massive Van Norman construction . . . world-known signature of this top-precision machine-tool plant . . . assures the rigidity that means accurately refinished bearing surfaces the *first* time . . . *every* time. *Send coupon today for full details.*

"It Pays to Van Normanize"

VAN NORMAN ALSO BUILDS THESE HEAVY-DUTY MACHINES:

Piston Grinder, 8" diam., 11" long. Boring Bars, 1/9" to 9" diam., 10" to 30" deep. Valve Regrinder, up to 1" stem. Brake Drum Lathes, up to 15" travel. Cylinder Hone, 8" diam., 18" deep. Head Grinders, automatic Pressure Plate & Flywheel Grinder. Pin and Rod Machine.

VAN NORMAN COMPANY
Springfield 7, Mass.

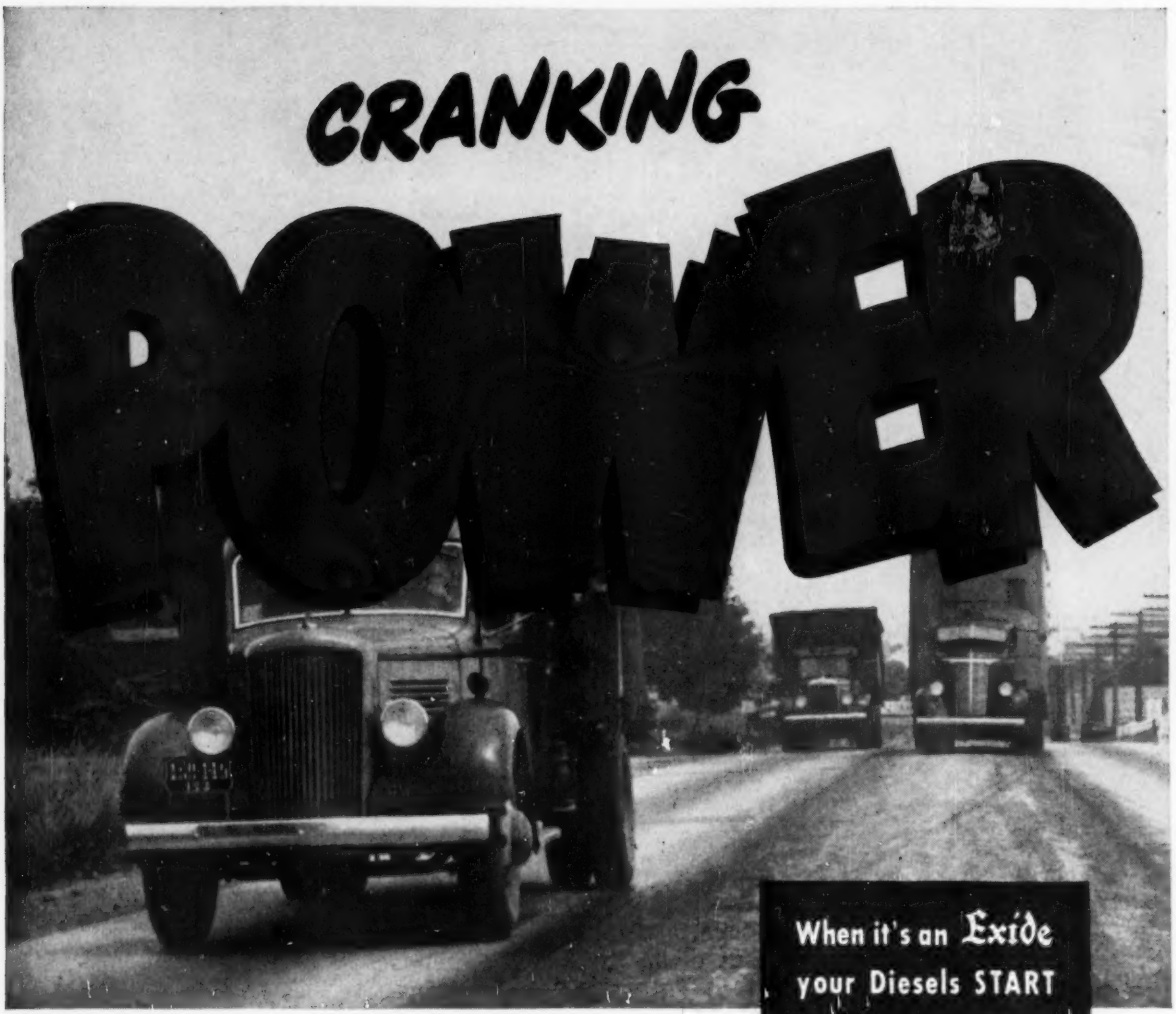
Please send literature and prices on No. 111-EL Regrinders.

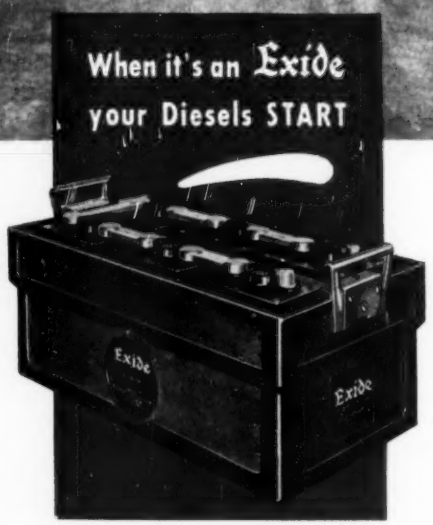
Name_____

Company_____

Address_____

City_____ Zone___ State_____





Day after day, in all climates, you can count on Exide cranking power

Exide Diesel Batteries are built specifically for heavy duty cranking jobs. They're a product of close cooperation of engine and starter builders and Exide research-engineering. Test after test, under the most exacting conditions, assures dependable starting in all types of Diesel-powered equipment. Exide Diesel Cranking Batteries give you:

HIGH MAINTAINED VOLTAGE for a *quick breakaway* and *high cranking speeds.*

EXTRA LONG LIFE—low depreciation, less frequent replacements.

LOW COSTS—operation, maintenance, repair.

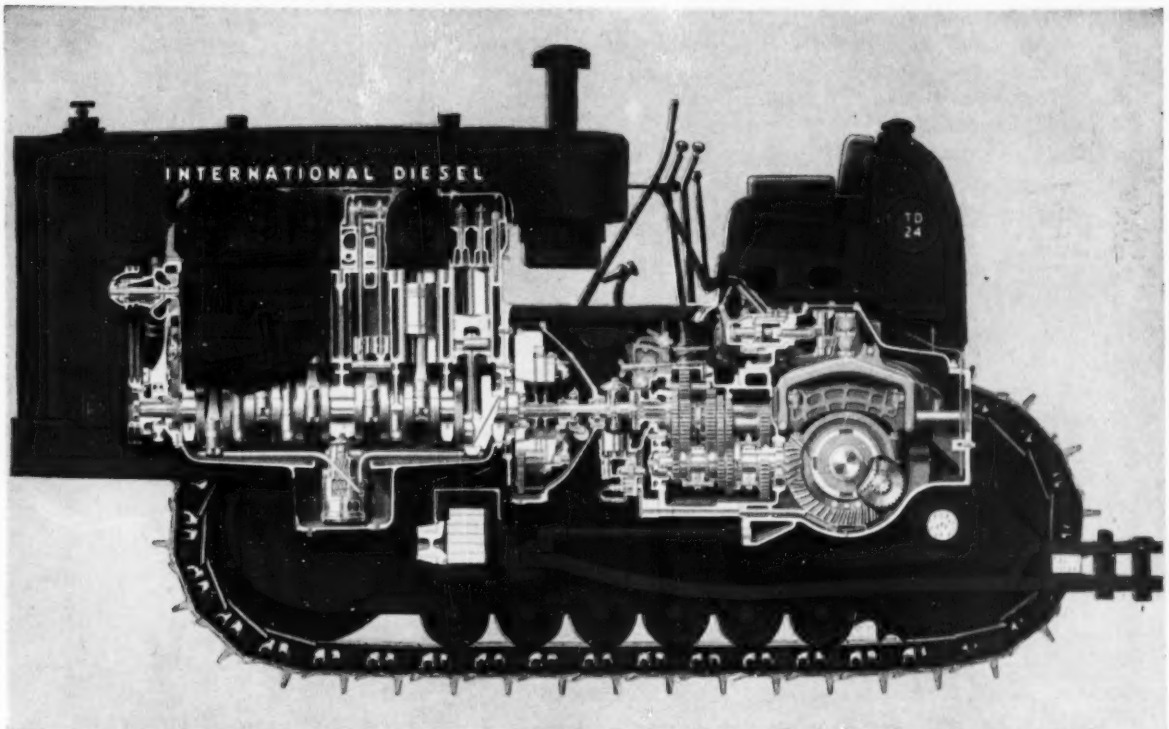
RUGGED CONSTRUCTION for rough usage and hard service.

Use Exide Diesel Cranking Batteries for all heavy-duty equipment . . . buses, trucks, tractors, off-the-highway equipment, ships, aircraft, power plants, Diesel-electric locomotives.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto
"Exide" *Reg. Trade-mark U. S. Pat. Off.*

1888
DEPENDABLE BATTERIES FOR 63 YEARS
1951

GUTS OF A CHAMP



Inside story of the TD-24

When two-legged people have guts, they finish the fight and do the job.

Real guts—that's what the world admires—man or machine.

You can't define what makes guts in a man, but you can "analyze" the fighting, working, dogged innards of the Champ. So let's put the X-ray on the TD-24:

Drawbar Horsepower: 148 working horsepower delivered at the drawbar in official tests.

Synchromesh Transmission: you "shift on-the-go," with eight speeds forward, eight reverse for faster time cycles.

Instant Speed Change: up or down one speed without declutching.

Planet Power Steering: all turns are easier . . . pivot turns, feathered turns, turns with power on both tracks.

Reserve Torque: gives the Champ the lugging ability to fight through temporary overloads.

Easy Steering: finger-tip hydraulic controls.

All-Weather Starting: push-button, gasoline-conversion starting—an International exclusive—gets you on the job fast.

More Work: the TD-24 is doing more work—with more speed and more lugging ability—than any other crawler tractor on the market.

Look it over. Then ask your International Industrial Distributor to show you what it can do for you. You'll be a TD-24 man from then on in.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

INTERNATIONAL INTERNATIONAL HARVESTER **POWER THAT PAYS**

CENTRAL BARGE COMPANY USES

BENDIX

FUEL INJECTION EQUIPMENT

Operating on the upper Mississippi the M/V A. M. THOMPSON of the Central Barge Company—powered by two Enterprise 8-cylinder, supercharged diesels, is doing a big job and doing it well. On each trip into the Twin Cities and the surrounding area this vessel tows from 12 to 15 barges containing 18,000 to 20,000 tons of coal —the equivalent of 350 to 400 carloads. As in many another marine job where dependable service is essential, Bendix is the choice for fuel injection equipment. In fact wherever big jobs are being done, you'll find Bendix fuel injection equipment playing its part in keeping diesel power at peak efficiency.

SCINTILLA MAGNETO DIVISION of Bendix AVIATION CORPORATION
SIDNEY, NEW YORK

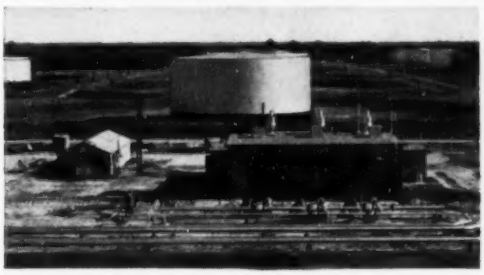
Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N.Y.
Western Office: 582 Market Street, San Francisco 4, Calif.

Here's real pumping power for Pipe Lines

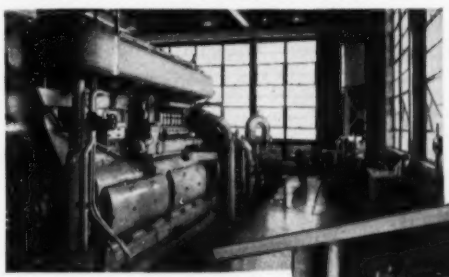
ALCO Diesel engine pumping installation at Patoka Station of The Texas-Empire Pipe Line Company System uses NO spare units.

Operation of these Alco diesels is so reliable that the Patoka Illinois Station uses no spare units—and yet must be ready at all times to pump vital crude oil by pipe line to refineries and connecting carriers. That's why Alco medium speed Diesels have been picked for the job. These dependable engines have operated 96% of the elapsed time at 94% of the manufacturer's rating, using centrifuged line crude for fuel. Operation is so reliable that the station uses no spare units. Such dependable performance is the chief reason why in the last ten years *more Alco Diesels have been installed in oil pipe line pumping service in the U. S. and Canada than any others.* For more details check now with American Locomotive Company, 30 Church Street, New York 7, or the nearest Alco Sales Office at Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady, St. Louis.

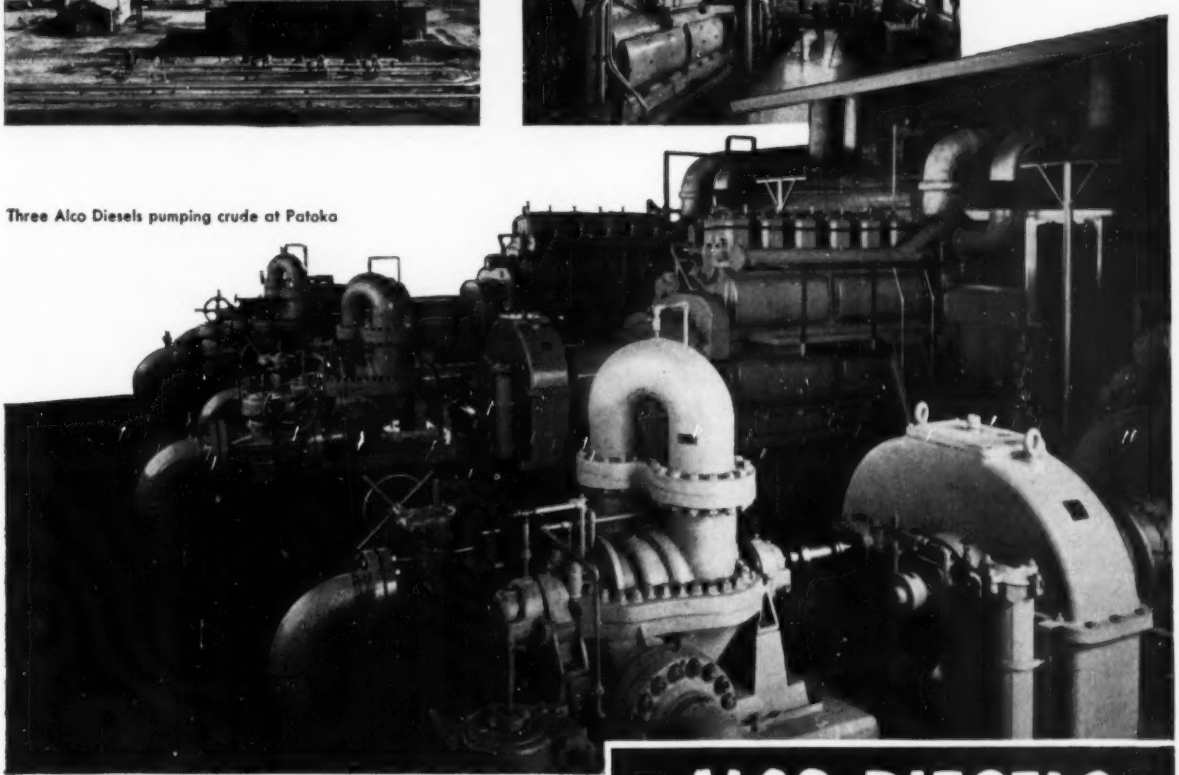
Outside view Patoka Pumping Station



Close-up view of one of the Alco Diesels at Patoka



Three Alco Diesels pumping crude at Patoka



SPEED Vs. WEAR

Remember, since piston speed and journal travel per minute are both almost the same in medium speed and slow speed engines, wear is equivalent as well. Not only do you get unequalled dependability with Alco Diesels—you get long wear and low maintenance costs, no matter how difficult the service conditions.

ALCO DIESELS

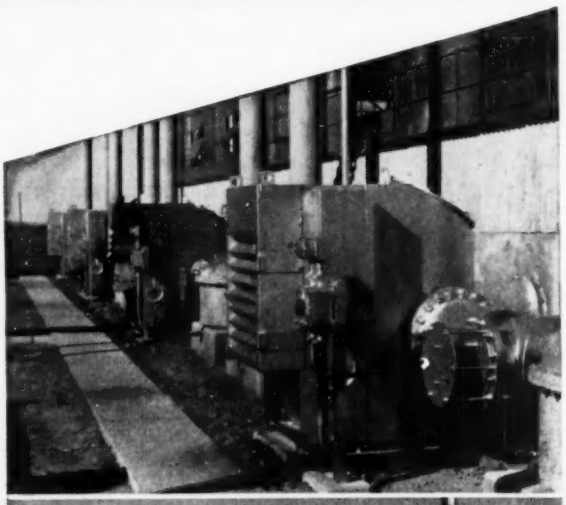
Alco

THE MARK OF MODERN ENGINEERING

AMERICAN LOCOMOTIVE COMPANY

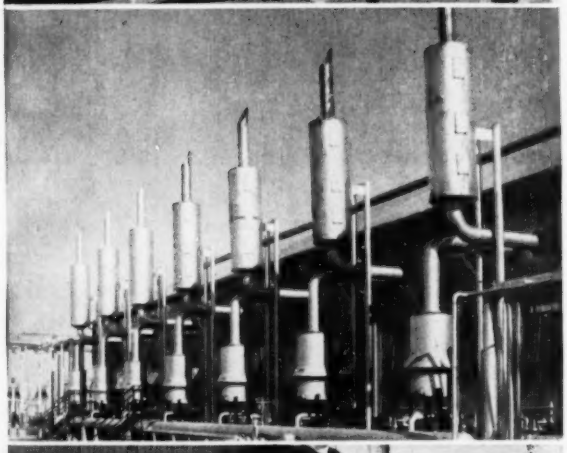
A TRIO OF TROUBLE SHOOTERS!

There's a unit in AAF's family of filters to solve every dust problem



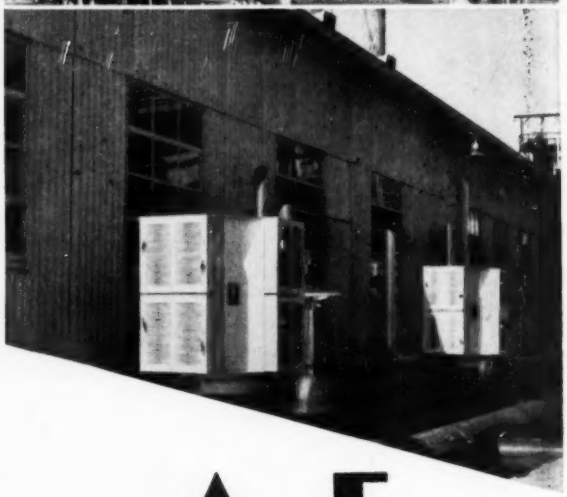
1. MULTI-DUTY TYPE CMS

An automatic air filter designed to handle heavy dust loads. Constant, high efficiency self-cleaning, under any load, assures uniform air delivery and low operating resistance. Maintenance consists of occasional sludge removal which is accomplished without shutting down the filter. For outdoor installation, as shown at right, filter is supplied with housing consisting of weather louvres for protection of the filter curtain and a plenum chamber to which engine or compressor intakes are attached. Ask for Bulletin No. 150.



2. CYCOIL AIR CLEANER

This oil bath air cleaner is a "dust bowl" veteran designed for heavy duty service. Regardless of load, the Cycoil operates at approximately 100% efficiency in dust removal. The reason—dirty air is first mixed thoroughly with oil and when the two are later separated by centrifugal action over 90% of the total dust content of the air is thrown out with the oil. The remaining dust in the air is then removed by the double filter cells at top of unit. Ask for Bulletin No. 130.



3. TYPE "OC-H" FILTERS

These viscous impingement filters are recommended for the protection of engines and compressors operating in industrial districts where the dust to be removed consists of street dust, coke breeze, soot, etc. Advantages of these washable unit-type filters are (1) low resistance to air flow; (2) high cleaning efficiency; (3) large dust-holding capacity; (4) low first cost; and (5) long life. Type "OC-H" filters are complete assemblies consisting of individual unit filters and housing. For outside installation, as shown at right, faces of filters are protected by easily removed weather louvres. Ask for Bulletin No. 120.

Write today for bulletins on any or all of these engine and compressor filters. And remember—experienced AAF engineers are available to consult with you on special dust problems at any time.

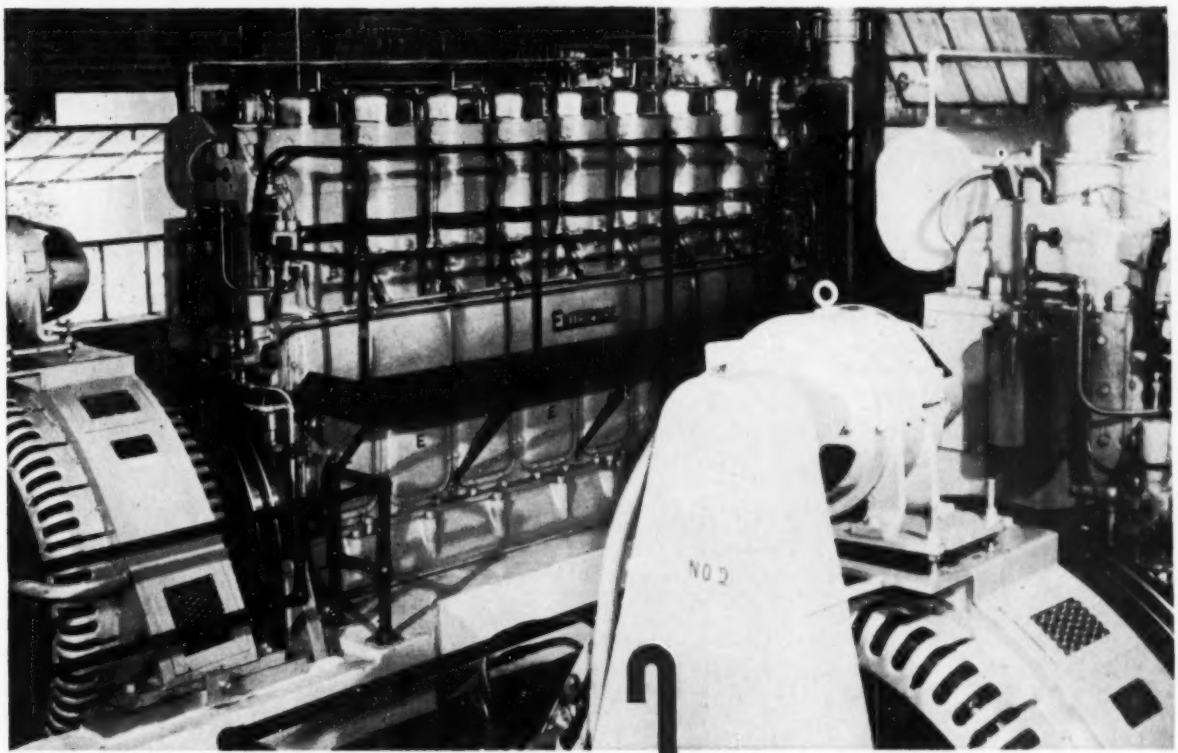
AAF

American Air Filter

COMPANY, INC.

445 Central Avenue, Louisville 8, Kentucky • Darling Bros., Ltd., Montreal, P. Q.

$33,526 PROFIT*



...Leads to Purchase of 3rd ENTERPRISE DIESEL

Positive proof of engine performance often lies in the profit picture. That's where the investment in new equipment pays off—or doesn't. At McLeansboro, Ill., where two of their three new Enterprise Diesels are now in operation, the proof is there: **the city's profit for the last fiscal year reached $33,526—including four months operating the old turbine generator system at a loss!* And with the installation of a third Enterprise Diesel, purchased as a result of the high operating performance of the first two, city officials predict the annual profit will jump to more than $38,000. The city of McLeansboro is now assured of 1) a reduction in electric rates, 2) sufficient and dependable power to take care of future growth and development, and 3) a modern power plant that is quickly paying for itself.

The story at McLeansboro is not uncommon where Enterprise Diesels have been put to work. Scores of these efficient units, serving the needs of progressive cities everywhere, daily demonstrate the fact that both power-wise and profit-wise, Enterprise is first in the field. *Enterprise Engine & Machinery Co. A Subsidiary of General Metals Corporation, 18th & Florida Sts., San Francisco 10, Calif.*

The Choice of Power Experts

Enterprise
STATIONARY
Diesels

It will be of interest to owners and operators of **DIESEL ENGINES**

to know that **18 YEARS AGO**

the Sharples Corporation equipped the first diesel engine with a **SINGLE STAGE**

centrifugal purification system for the use of **BUNKER C and OTHER HEAVY OILS**

as an economical fuel.

Since 1932 many highly satisfactory Sharples installations on land and afloat have been put in operation with significant savings. Today, you can count on the almost 20 years' experience of The Sharples Corporation for similar economies—your inquiry will be given our prompt attention.

BOSTON NEW YORK PITTSBURGH
CLEVELAND DETROIT CHICAGO
NEW ORLEANS SEATTLE LOS ANGELES
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SHARPLES

THE SHARPLES CORPORATION

2300 Westmoreland Street, Philadelphia 40, Pa.

GULF DIESELMOTIVE OIL

provides better lubrication for Diesel Locomotives

Cutaway view of a 6-cylinder supercharged locomotive Diesel engine, rated 500 hp at 1000 rpm.

effective detergency **-keeps engines cleaner**

lasts longer **-extends oil change period**

provides better protection **-insures less wear, lower maintenance costs**

GULF Dieselmotive oil provides the kind of lubrication that means higher availability and lower maintenance costs for railroad Diesel locomotives.

The effective detergent action of this quality lubricating oil prevents deposit of sludge- and varnish-forming materials — keeps piston rings and valve stems free, helps you avoid cylinder head changes.

Gulf Dieselmotive Oil has outstanding resistance to oxidation and sludging, maintains a low neutralization number. You also make a saving in lubricant costs because Gulf Dieselmotive Oil lasts longer. And it is noncorrosive to alloy bearings.

Diesel locomotives in both main line and switching service are setting maintenance records with Gulf Dieselmotive Oil that are hard to beat. To get the advantage of this outstanding Diesel lubricating oil in your engines, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

P&H DIESEL ENGINES

2-CYCLE

FEWER PARTS

MEAN FEWER TROUBLES FOR YOU

You'll like the way so many parts have been designed *out* of P&H Diesels. It makes them simpler, more dependable for all types of service. It makes them easier to understand, easier to service. It lets you cut parts inventory — and costs, too! It's another important reason why experienced users are switching to P&H Diesels . . . *standardizing on them.* Five models: 1, 2, 3, 4, and 6-cyl. For literature, write P&H Diesel Division, Harnischfeger Corporation, Port Washington, Wisconsin.

P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
PORT WASHINGTON WISCONSIN, U. S. A.

Beat Heat...

GUN IRON CAST PARTS

Gun Iron maintains full tensile strength up to 850° F. Growth amounts to only ¼ of 1% in linear dimensions at 900° F. By use of alloys, these limits can be raised much higher.

This exceptional heat resistance gives added service to diesel parts subjected to prolonged high operating temperatures. Gun Iron always proves superior on the toughest assignments, too, because of its other properties of great resistance to wear, pressure and erosion.

Our engineers and laboratories stand ready to help you determine the advantages of Gun Iron for your parts. Our extensive manufacturing facilities are a dependable source for finishing them accurately and economically. **HUNT-SPILLER MANUFACTURING CORP., 373 Dorchester Ave., Boston 27, Mass.**

Canadian Representatives: Jos. Robb & Co., Ltd., 4050 Namur St., Montreal 16, P.Q.

***HERE IS A PRACTICAL GUIDE** for the user of iron and steel castings . . . 24 pages of technical data on many types of metals and alloys. Write for your free copy.*

MACHINES OF GREAT PERFORMANCE

USE THE MOST DEPENDABLE OILING

SYSTEM EVER DEVELOPED

Madison-Kipp Lubricator Model SVH, providing controlled force-feed lubrication through non-clouding sight feeds to the cylinders of an Ingersoll-Rand XRE-1 Synchronous - motor - driven Ammonia Compressor. There are Madison-Kipp Lubricators for original standard equipment for almost every type of machine tools, work engines, and compressors.

MADISON-KIPP CORPORATION

205 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

UNION OIL COMPANY cuts cylinder wear, lengthens service of equipment with...

...KOPPERS *K-Spun* Porous Chrome* PISTON RINGS

Koppers K-Spun Piston Rings, produced by an exclusive centrifugal casting process, are 100% stronger and four times more resistant to combustion shock than ordinary cast iron rings, and will not break in installation or in service.

Koppers Porous Chrome Rings have a porous chrome surface that holds and distributes oil during break-in, quickly wears down to perfectly seated solid chrome that prevents grit and other particles from embedding in the ring surface where they can scratch cylinder walls. Porous Chrome Rings last up to four times as long as other rings, reduce cylinder wear 50% or more.

That's why hundreds of companies like Union Oil are reporting amazing savings in equipment and maintenance costs through the use of Koppers Rings. Remember . . . we make rings for *anything* that uses piston rings.

If you have a piston ring problem, why not get the *right* answer from us? Write, wire or phone KOPPERS CO., INC., *Piston Ring Dept.*, 1542 Hamburg St., Baltimore 3, Maryland.

Union Oil Company's newly modernized Avila (California) Terminal utilizes three 460 h.p. Enterprise dual-fuel engines with single-stage Ingersoll-Rand SHV centrifugal pumps. Engines are 6 cylinder, 12" bore, 15" stroke, 4 cycle, 450 rpm, non-supercharged. Each piston is fitted with two Porous Chrome, three tapered and two oilcutter Koppers Piston Rings.

KOPPERS

KOPPERS

AMERICAN HAMMERED

PISTON RINGS

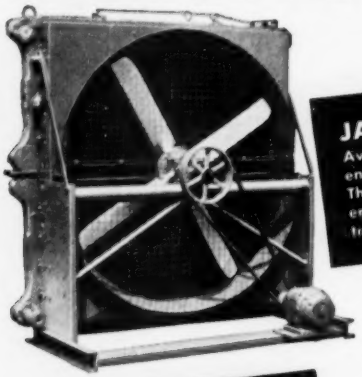
*VAN DER HORST PROCESS

ONLY KOPPERS CAN FURNISH K-SPUN OR POROUS CHROME!

YOUNG OFFERS . . .

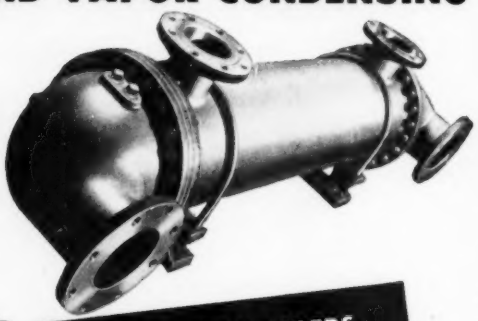
EFFICIENT HEAT TRANSFER

IN WATER, OIL, GAS COOLING-STEAM AND VAPOR CONDENSING



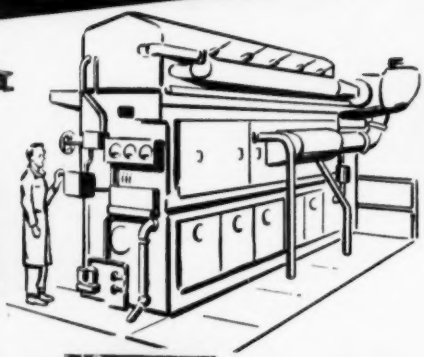
JACKET WATER COOLERS

Available in a wide range of sizes for engine jacket water or lube oil cooling. These units are sturdy, compact, and engineered to provide maximum heat transfer with low hp requirement.



"HC" COOLERS

Multiple unit installations provide economical handling of water, oil or gas cooling and steam and vapor condensing in any combination. Easily installed in the field.

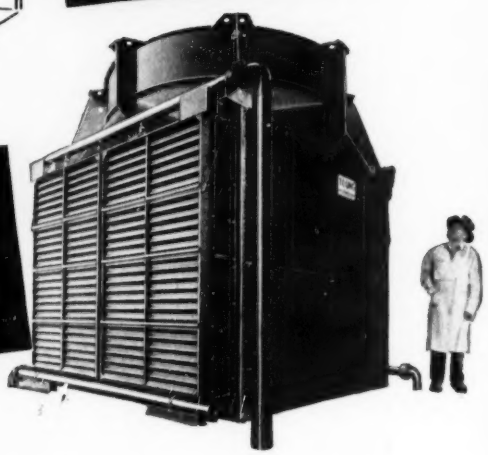


HEAT EXCHANGERS

Space-saving units available from stock in fixed or removable tube bundle types. For jacket water or lube oil cooling in stationary or marine (fresh and salt water) applications.

"VAD" COOLING AND CONDENSING UNITS

Vertical air discharge units for extra large capacity cooling of water, oil and gas and condensing of steam and vapor in any combination. Low-level mounting means ease and economy in maintenance.



In addition to the field-tested products shown above, Young offers: gas, gasoline and Diesel engine cooling radiators; atmospheric and evaporative coolers and condensers; supercharger intercoolers, and similar products for the Diesel engine field. Young supplements the design engineering of its equipment with application ingenuity thereby increasing the practicability of all Young products. For example, the popular "Vertiflow" Unit Heater, has been used successfully as an economical condenser. It can also cut heating costs by using the waste heat from engine jacket water for space heating. Young *engineered* applications cost no more. Contact your nearest Young Representative for further details.

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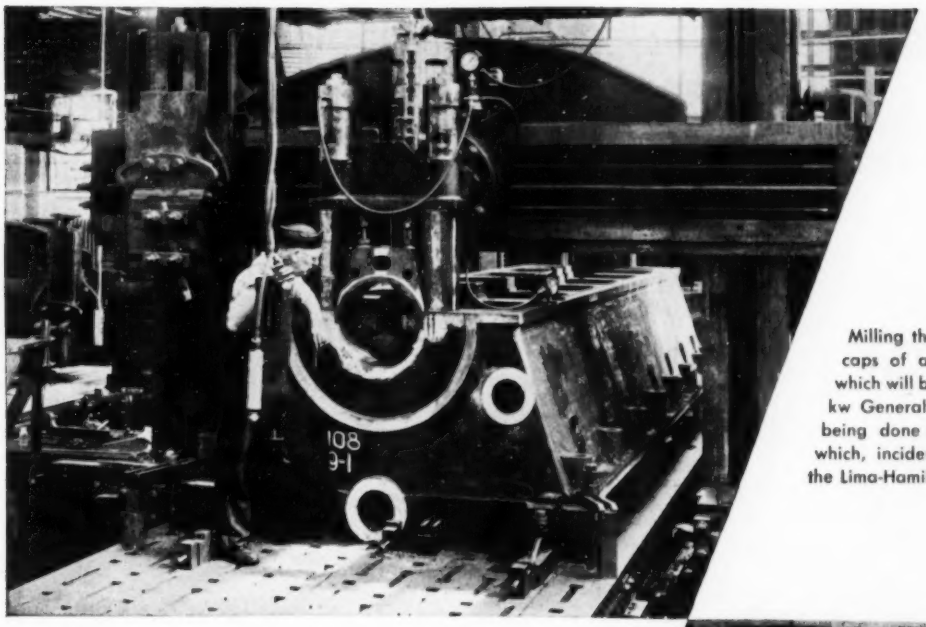
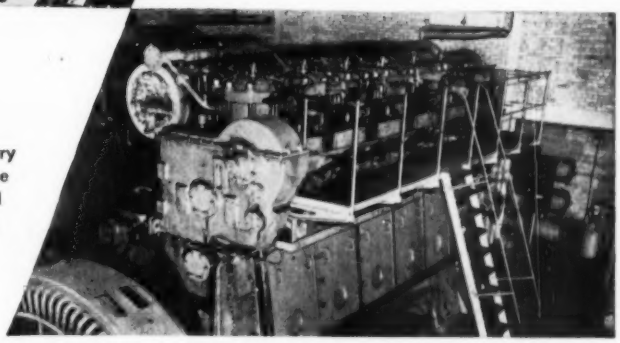


Milling the main bearing saddles and caps of a 6-cylinder Hamilton diesel which will be direct-connected to a 2000-kw General Electric generator. Work is being done on a Niles 10-foot planer which, incidentally, is also a product of the Lima-Hamilton Corporation.



The Anaconda diesel, when installed, will look very much like this 6-cylinder 2250-hp Hamilton engine at Harwood, N. D. The generator, however, will be d-c to supply power for electrolytic refining of copper.

How perfect bearing alignment is achieved on

HAMILTON DIESELS

This casting, approximately 22 feet long and weighing 20 tons, is the bed plate of a Hamilton diesel being built for Anaconda Copper Mining Company. It will be delivered late this fall, to power a General Electric 2000-kw, 250-volt, 250-rpm direct-current generator.

The significance of the photograph is this: It shows how perfect bearing alignment is achieved on Hamilton diesels.

The bed plate is completely planed. Then a milling head is mounted on the cross rail of the planer, and without disturbing the setting of the bed plate, the bearing shell saddles are milled. This is done with the caps in place—*under exactly the same conditions which prevail when the engine is operated.* Thus perfect alignment is obtained.

Such precision in manufacture pays off in lower maintenance for the user.

* * *

Hamilton diesels, with 21½ inch bore and 27½ inch stroke, are available with 5 to 12 cylinders. Ratings are 485 bhp (net) per cylinder as a straight diesel or as a dual fuel engine, both at 257 rpm. For full information, call the Baldwin-Lima-Hamilton Sales Offices in New York or Chicago, representatives in other cities, or write direct to Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.

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DIESEL

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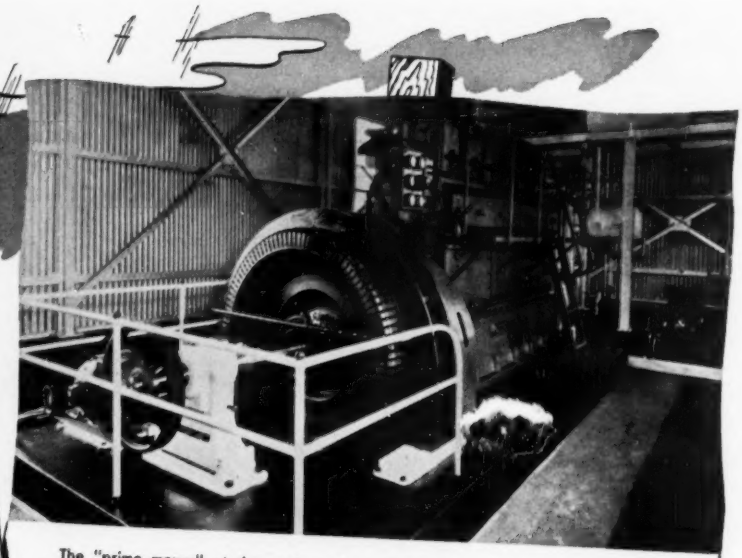

The "prime mover" at the modern plant of Bonneville, Ltd., Wendover, Utah. A Worthington Supercharged Diesel Engine, Type SCC-6. Worthington auxiliaries are used for the water cooling system.

Worthington Engine Outstanding For Economy and Dependability Under Difficult Conditions

Organized in 1935, Bonneville, Ltd., is a primary source of commercial potash, producing 70,000 tons annually from the evaporating ponds in the Wendover, Utah, Salt Flats area. This remote site of the world's automobile speed records is far from public utility plants, even from adequate fresh water supply. Power, therefore, is a problem.

Management found the solution in a Worthington Supercharged Diesel, Type SCC-6, rated 489 hp at 4,250 ft elevation.

Replacing several small, high speed Diesels, the new Worthington unit is the sole electrical generating source in a set-up designed by Worthington engineers to deliver maximum power from the fuel consumed, and to operate with a cooling system requiring a minimum of make-up water.

For The Record

The Bonneville Worthington has lived up to every expectation for efficient, cost-cutting performance. *Consumption of fuel oil is at the rate of 14.25 kw hours per gallon at this altitude. Also, over 73% of the low-cost fuel oil is put to useful work — utilization of heat from the exhaust and from the cooling system (high-temperature type) being a main factor in achieving this high percentage.*

To a broad range of ratings including every type of heavy duty Diesel and gas engine, Worthington adds outstanding engineering knowledge and a rich background of experience — and technical assistance to help you get the most out of your own power planning. For further details of the dependable, economical Diesel performance that proves *there's more worth in Worthington*, contact *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

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Diesel engines, 150 to 3,520 hp . . . gas engines, 175 to 3,520 hp . . . dual fuel engines, 225 to 3,290 hp.

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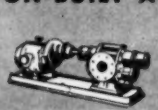
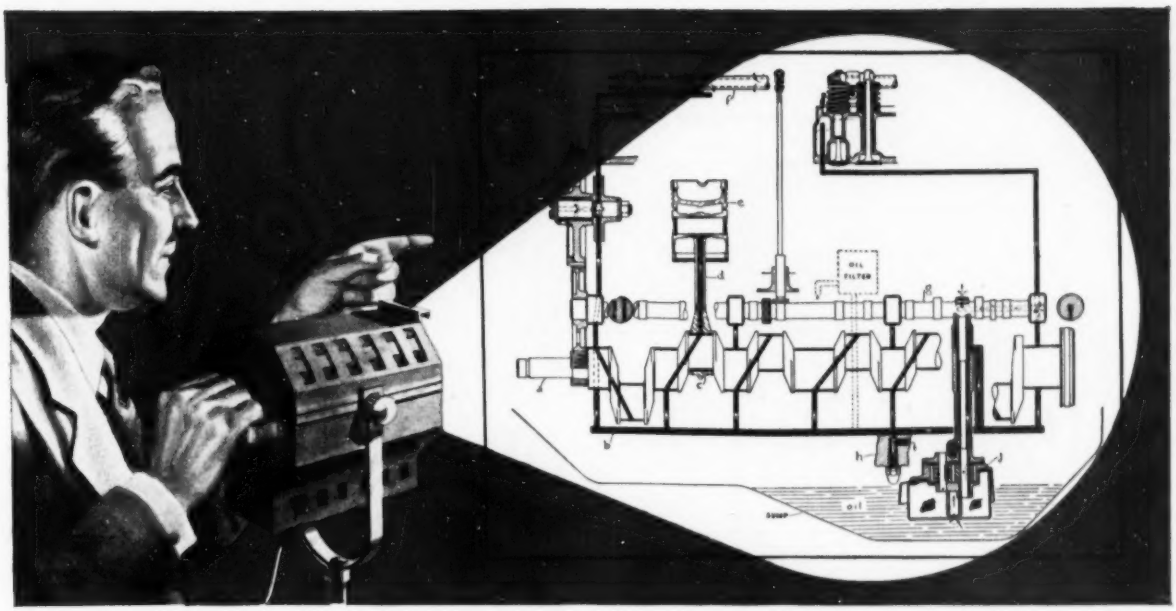


Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler



Man with a new light on your DIESEL LUBRICATION

EVEN THE NORMAL EFFECTS from compression, combustion and load make it tough enough for any Diesel engine oil. Yet in addition you want to be sure your Diesel oil will be master of special needs—sometimes imposed by particular mechanical conditions . . . or by fuel characteristics, load or even by factors of climate and altitude.

You'll get a new light on this whole range of lubrication complexities, as it affects your own Diesels, by calling in a Cities Service Diesel Lubrication engineer. He is qualified to tailor a Diesel lubrication program that will contribute to maximum hourly output and sharply lower costs. Like scores of other Diesel operators throughout industry you can profit by drawing on the knowledge and experience of a Cities Service Diesel specialist. Contact the office nearest you, or return the coupon below. It brings details—plus a valuable Diesel booklet, free.

The Cities Service complete line of top quality petroleum products includes a Diesel lubricant for every operating condition.

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Returning 27% on Investment

THE Terminal Railroad Association of St. Louis reports that General Motors Diesel switching locomotives save $3.71 an hour per unit over the cost of operating and maintaining the steam engines they replaced.

Savings on fuel, water, maintenance and enginehouse expense total $25,556 a year per unit—a return of 26.94% on investment.

But even this does not reflect the full potential savings with General Motors Diesel switchers. Their ability to stay on the job longer, coupled with superior flexibility, means fewer locomotives required to handle 24-hour daily operation. Better visibility and high tractive effort make possible faster and smoother car movements with greater safety and reduced damage claims.

All this means that freight and passenger trains move through yards and terminals faster, at lower cost—another way General Motors locomotives help railroads get *more* traffic and hold present business in the face of stiff competition.

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A Green Light for Economy in Railroad Operation

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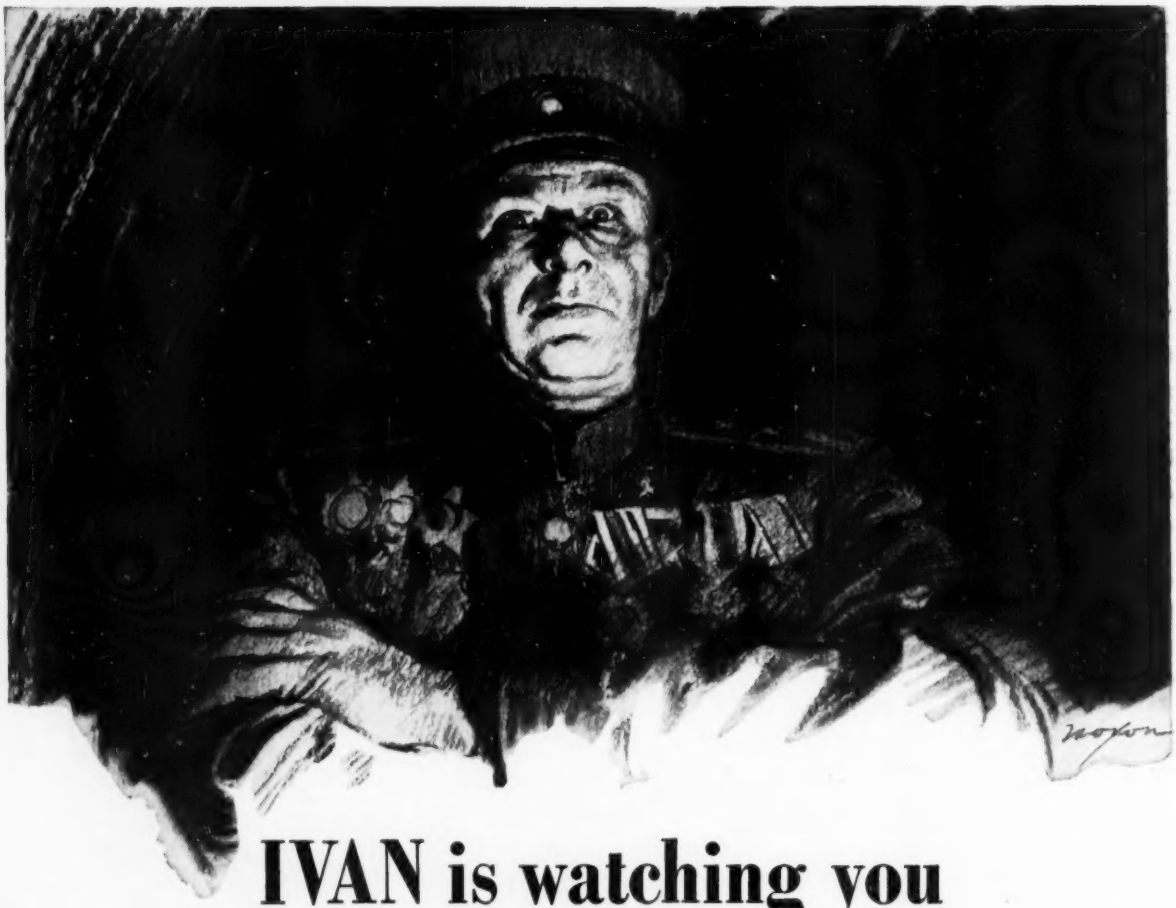

IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

FREE . . . this important booklet tells you how our American System Grew Great

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

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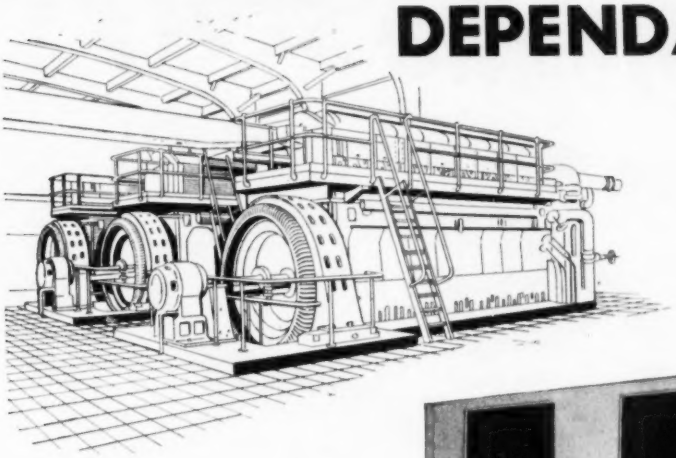
THE BETTER WE PRODUCE
THE STRONGER WE GROW

FINE DIESELS REQUIRE DEPENDABLE COOLING

by

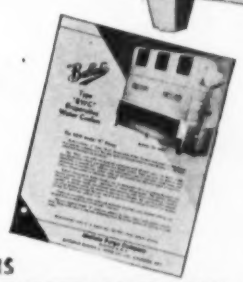
"Buffalo"



"Buffalo"

EVAPORATIVE COOLERS

Many of the country's top-ranking Diesels are cooled by "Buffalo" Evaporate Coolers—because these units keep water jacket temperatures to within a very few degrees of the setting, through long runs and fluctuating loads. "Buffalo" Coolers require minimum space, use little spray water and are easy to operate. And quality "Buffalo" construction Pumps and Spray Nozzles and Aerofin Coils are standard equipment—tops in the business. WRITE FOR BULLETIN 3666 and have a "Buffalo" engineer show you how "Buffalo" Coolers can give your Diesels the temperature protection they require.



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EVAPORATIVE COOLERS AND AXIAL FLOW FANS FOR COOLING MOBILE AND STATIONARY DIESELS

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Vol. 29 No. 2 February, 1951

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International Harvester truck-trailer combine used to haul livestock in the West.

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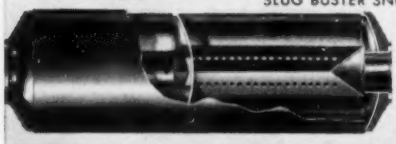
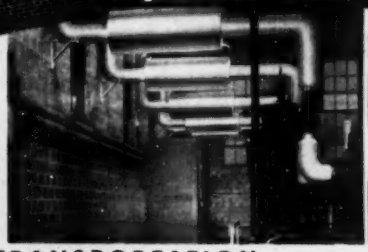
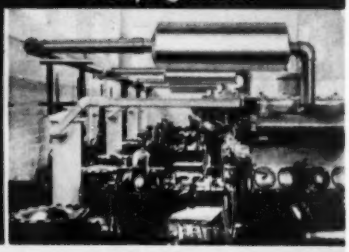


UTILITIES

Sewage Treatment Plant



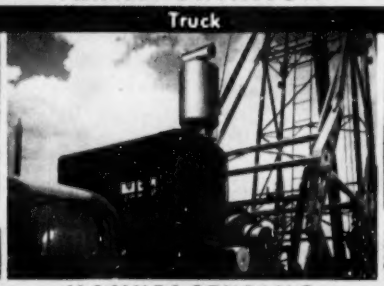
Pumping Station



TRANSPORTATION

Train

Truck



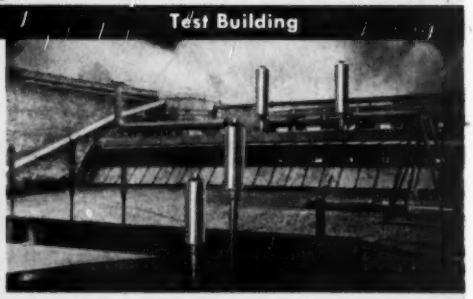
Tug

MANUFACTURING

Compressed Air System

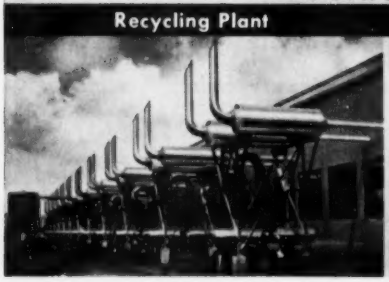
SNUB THE SLUG AND STOP THE NOISE

Test Building



PETROLEUM

Recycling Plant



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Thick walls of sound-absorbing material soak up noise. You can hear easily . . . talk comfortably in noisy surroundings. Suited to any location. Modern in appearance. Wall and floor models. Doorless.

AS PUBLISHERS, we were very proud to be present at an event which clearly demonstrated that those in high places hold Business Papers in great esteem. The importance of the Business Press and its tremendous capacity for leadership and service in all phases of industry was attested in addresses by such notables—headed by the Hon. Harry S. Truman—as Maj. Gen. W. H. Harrison, Administrator of the National Production Authority; John D. Small, Chairman of the Munitions Board; Michael V. DiSalle, Director of Price Stabilization; to name a few. Many of similar stature lent support by their presence and still others, unable to attend due to press of important work, expressed by telegram their confidence in, and appreciation of the role of Business Papers in the difficult times ahead.

The occasion: A Mobilization Dinner sponsored by the Society of Business Magazine Editors. The purpose: To once again offer the manifold services of the Business Papers to aid in the present emergency and to ask for direction in this task. Society members and others present dedicated themselves to this purpose by unanimously supporting the Resolution appearing below.

WHEREAS it is now clear that we who believe in the freedom of mankind are involved in a great world struggle with those who do not, and

WHEREAS this struggle may be the last opportunity to prove that free labor led by free management can produce more than slave labor under dictators.

THEREFORE, be it resolved that:

We who enjoy individual freedom as independent editors of America's business magazines do hereby pledge ourselves as editors to arouse and support the kind of productive effort that will demonstrate the omnipotent power of the free spirit.

We, as a portion of the Business Press representing the Diesel Industry, heartily subscribe to this dedication and will do our part unstintingly. Our editorial policy has always been high and the backbone of our efforts. We have sought to promote the Industry; to keep it informed of new developments and trends; new services and techniques of operation and maintenance; and in general, to foster greater efficiency in the fields of application of the Industry's products. We shall continue this policy and strive to improve our capacity for service.

To further this end, we offer our pages as a medium of communication for constructive information to those in the Industry as well as to Government. Those of discernment are fully aware of the serious and difficult tasks ahead and it is their job—and ours—to awaken others to the grim facts. Communication of ideas is essential to this task; leadership and direction are necessary. We, through our Editors, pledge ourselves to this purpose and encourage the participation of both Industry and Government as allies to render our job more effective.

James E. Jones G. Renfrew Brighton

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Do your diesels have to handle frequent peak loads? Or operate continuously at high temperatures? Or have long idling periods? Then Sinclair GASCON OIL HD is the lubricant for you.

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GASCON OIL HD in your diesels will pay dividends.

• • •

Diesel locomotives live a harder life than most stationary diesels—accelerating, slowing up, climbing grades . . . amid changing climatic conditions. GASCON® OIL HD has proven itself in this difficult service. It is used by over 60 of America's top railroads to protect their costly locomotive investment.

For lubrication counsel, see your nearest Sinclair Representative or write direct to Sinclair Refining Company, 630 Fifth Avenue, New York 20, N. Y.

+ HIGHLIGHTS +

● When units now on order have been delivered, 85 per cent of the Wabash RR freight service will be dieselized.

● During December last, Baldwin booked orders for a total of 58 diesel locomotives.

● The 1951 conference of the American Society of Lubrication Engineers will be held in Philadelphia, April 16-18.

● A new national record for heavy industry operation without a lost-time accident has been set by EMD Plant No. 3 at Cleveland.

● There are more than 7000 diesel trucks operating in Great Britain according to the current issue of "The Motor Industry of Great Britain."

● Oldsmobile Division of GM is using a device which is said to remove carbon in combustion chambers of engines by a blast of rice.

● From the Viking Pump Co. house organ we pick up the following gem: "A communist is a guy who says everything is perfect in Russia but stays here because he likes to rough it."

● Testifying at a rate rise hearing recently, a bus company official said that the purchase of 20 diesel buses would enable the company to save $19,140 per year in fuel costs.

● Because officials objected to the noise of power tools used during internment services in a West Coast cemetary, Burgess Manning silencers were placed on the tools, thus eliminating both the noise and objections.

● According to tests, a diesel engine can put a truck into motion at lower take-off speeds than can a gasoline engine. The driver who remembers this will save fuel and tires as well as lengthening engine life.

● When hauled by a diesel locomotive, a 40-ton freight car travels 16 miles per gallon of fuel used.

● Shareholders of the Reliance Electric & Engineering Co. have approved a two-for-one split of the firm's stock.

● The Jersey Central recently ordered 31 diesel locomotives. Delivery is scheduled for the fall.

● Announcement of the sale of Diamond Chain Co., Inc., to American Steel Foundries, Chicago, was made recently.

● The B & O had 78 diesel locomotives and switchers recently delivered or scheduled for delivery during this year.

● A glass fiber filter paper developed by the Naval Research Labs is 5000 times more effective than present commercially available filters.

● From statements by representatives of leading oil companies, it appeared that the oil industry would have held prices around present levels even if price controls were not applied.

● Production of diesel electric locomotives is being developed steadily in Glasgow where the North British Locomotive Co. Ltd. operates the largest locomotive engineering works in Europe.

● The need for inspecting replacement parts before installation was forcibly demonstrated to one plant engineer recently. A newly-installed liner had a crack at the head flange which permitted water to enter the cylinder and come between the piston and head. The head was blown off and the cylinder casting broken. Total cost, chargeable to poor maintenance and repair—$18,000. Don't let this happen to you!

● Texas and Pacific RR has announced plans to spend $4 million for 18 new diesel locomotives.

● The Great Northern Railway has announced the purchase from EMD of 39 diesel-electric locomotives.

● Because of the mechanization of our farms, our farmers now use three times the quantity of petroleum products they did in 1930.

● The Illinois Central has announced plans to spend more than $10,500,000 on new equipment, including 40 switchers and four passenger locomotives.

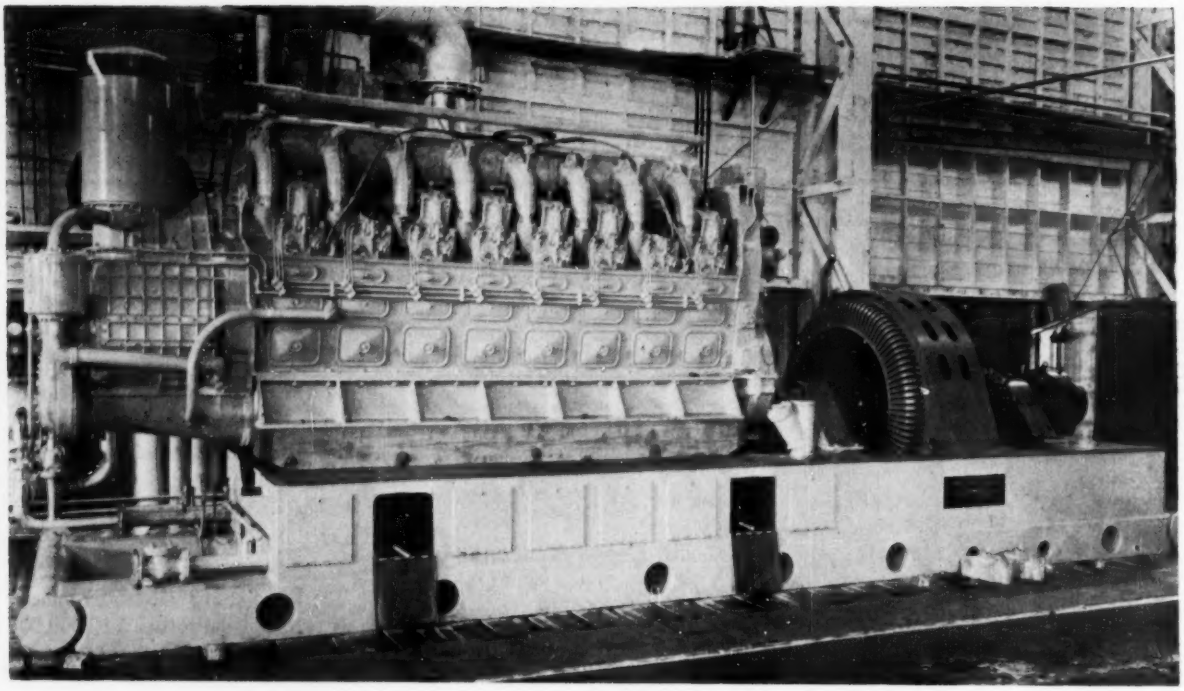
● During peak periods of the last war, more electricity was consumed for aluminum production in one day than would normally be used by a city of 60,000 homes in an entire year.

● Directors of American Bosch, diesel injection equipment manufacturer, declared a 20 per cent stock dividend last month in additoin to the regular payment.

● New locomotives were added to the nation's railroads in 1950 at a faster rate than at any time in the last century. The vast majority of the locomotives added were diesel-electrics.

● Alcoa has announced plans to build a new alumina plant near Bauxite, Ark. This plant will supply refined ore to such plants as the Point Comfort installation, world's largest internal combustion engine plant.

● More than 41 billion dollars will be received by state treasuries for road purposes in the next 12 years according to the API. This indicates a continued supply of building funds and a continued demand for diesel-powered road construction equipment.



When minimum shipping height is required, the engine is handled as a separate unit. Built-in jacks (handles in access doors) raise the unit for placement of the shipping skid as shown.

Central Station Operation with Portability

Large portable power plants, a World War II conception, did yeoman service and were quickly adopted by civilian agencies to meet emergency demands for power. Such power units as the one described should find ready application, both civilian and military, in the critical days ahead.

POWER demands in our expanding economy have largely kept pace with increased power facilities. Natural disasters, strikes, fuel shortages, water shortages, etc., have proven the advisability of stand-by power units. Frequently, it is impossible to install permanent capacity fast enough to meet the need for additional power. Add to the list above the possibility of war damage and the tremendous expected demands of a semi-war economy and it is apparent that large sources of immediately available power will find wide application.

Diesel generating units in the 10- to 100-kw. sizes are tremendously popular and widely applied but now we speak of units in the 1000-kw. class. The idea of large portable power plants is believed to have had its inception during the last war when they were first manufactured for the Armed Services in preparation for the invasion of the Continent. Large power plants and power barges, capable of supplying the demands of good sized cities, were the result.

There is little reason to doubt the practicality of such units on the basis of precedent: witness the half-Liberty ship towed to Alaska for power generation; the motorship that supplied the Chicago Opera House in the absence of usual power; and what is the diesel-electric locomotive but a self-contained electrical generating power plant?

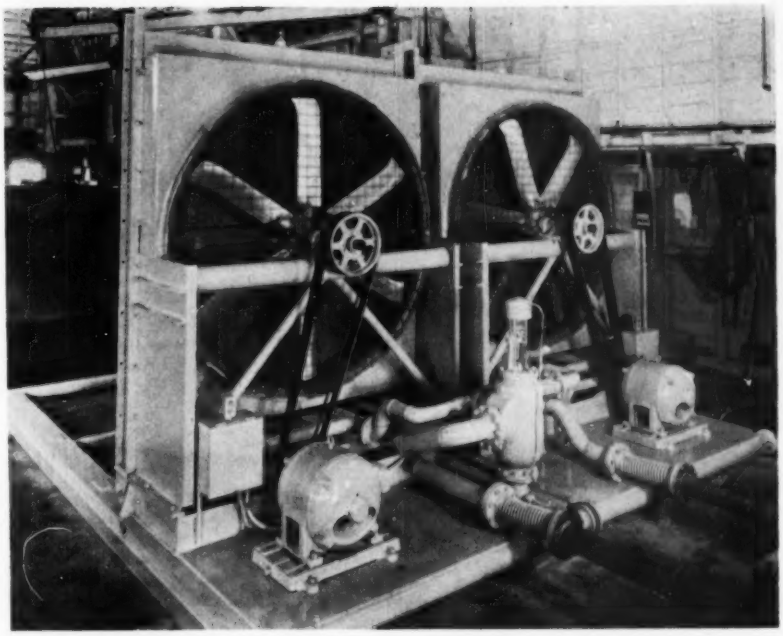
A recent example of the application and the advanced design of large portable power plants can be found in one of four identical units built by A. G. Schoonmaker Company at their Sausalito, Calif., plant for the Mexican Federal Power Commission. These 1000-kw. units were built to furnish power for utilities, municipalities and industrial plants in Mexico during various emergency periods. They culminate 3½ years of development of such units by Schoonmaker.

A number of earlier but somewhat similar units have been in service in Mexico for the past three years and when repeating their order, the Mexican Government specified certain important features and objectives for incorporation in the new models. They were to be portable self-contained units

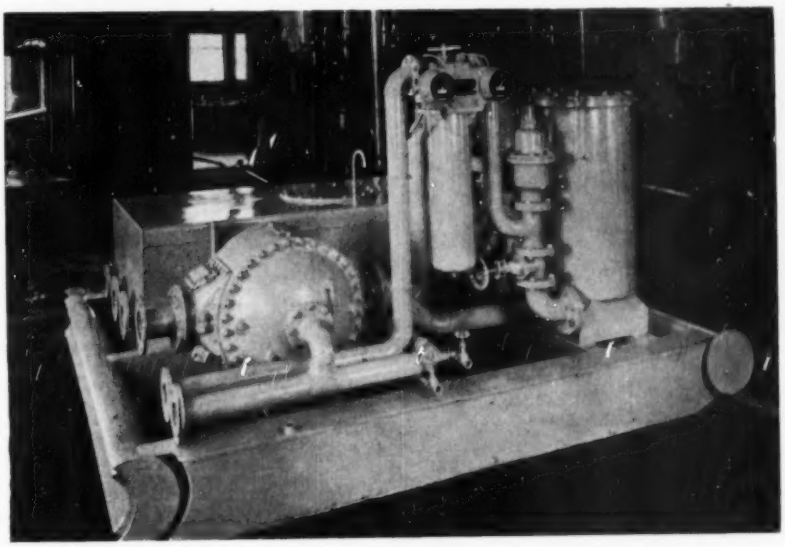
which could, upon arrival, be immediately assembled with the least expenditure of time, material and labor, and were to require no foundation or mats.

Further, they had to be adaptable to truck or narrow gauge railroad transportation and thus weight and size limitations were imposed. The units were to provide heavy duty continuous service and operating efficiency must equal that of stationary equipment.

To meet these manifold requirements it was found necessary to break the overall installation down into seven major sub-assemblies or functional groups. These are: main engine generator assembly; lubricating oil assembly; radiator assembly (for jacket water and lube oil cooling); fuel oil tank assembly; starting air assembly; muffler assembly; and switchgear assembly. These will be discussed in turn.



Elements of the jacket water and lube oil cooling system. Above are the twin radiator units with individual fan drives and common temperature control valve. Note hinge mounting and skid extension for flat radiator shipment. Skid below includes lube oil sump, filter and cooling system.



Main Engine Generator Assembly

The prime mover is a Cleveland Diesel Engine Division, General Motors, model 16-278A unit of the type which gave such a good account of itself during the last war. It is rated 1600 hp. and is direct connected to an Electric Machinery generator. Both are mounted on a common steel subbase and the design incorporates several interesting features.

To meet the most stringent transportational requirements it is necessary for the engine to be removed from the sub-base and handled separately. To facilitate this work, built-in screw jacks, operated through access doors in the sub-base, are provided to raise the engine sufficiently to allow specially designed wooden shipping skids to be placed under it.

A special flexible coupling, designed by the builder and built by the Thomas Flexible Coupling Company, is used to connect the engine to the generator. Purpose of the design is to permit disconnection of the engine from the generator without disturbing alignment.

The generator shaft is extra long to permit shifting of the stator without interference of pedestal supports to simplify any field repairs that might prove necessary.

Lubricating Oil Assembly

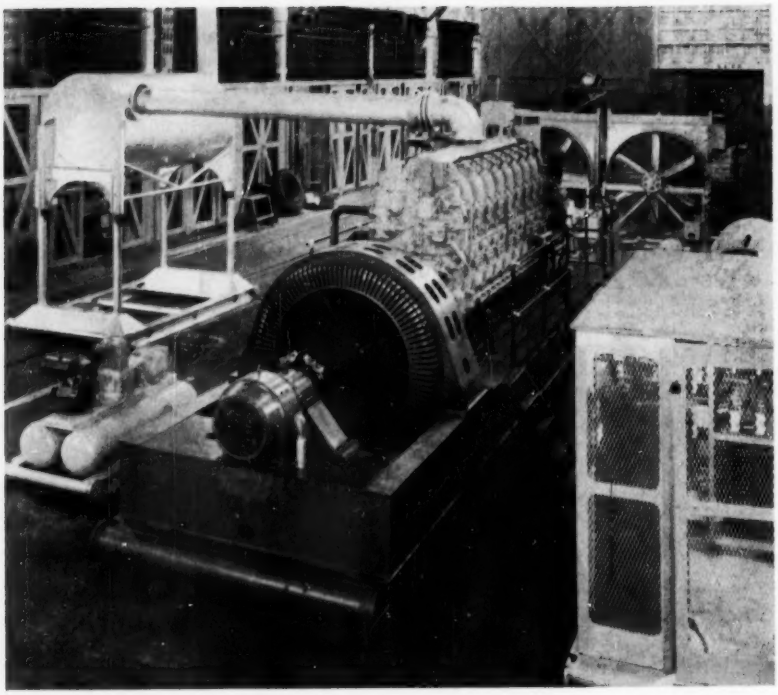
All accessory lube oil equipment is mounted on a separate skid which couples directly to the main sub-base. In this position all water and oil pipes line up with those of the major unit. Flexible sections simplify connection.

Incorporated in the assembly is the engine sump tank, lube oil strainers and filters and a Harrison cooler. Piping includes all the necessary by-passes, safety relief valves, etc.

Radiator Assembly

In line with and beyond the lube oil skid is the radiator type cooling system so located to maintain continuity of water flow. Two Young radiators are individually mounted on skids placed side by side. Hinge pins hold the radiators to the bases and permit them to be folded down to save space and protect the cores during shipment.

On one of the skids is mounted a Fulton Sylphon thermostatic control



Arrangement of the various components. In right foreground is switchgear skid (back shown) with top of day tank visible beyond. Lube oil skid is between main assembly and radiators. At left are starting air and muffler skids.

valve and by-pass piping to maintain constant engine temperatures. Cooling fans are vee-belt driven by electric motors taking their power from the generator output. Here again, all piping between assemblies is in alignment and connection is further simplified by the use of flexible sections.

Day Tank and Starting Air Assemblies

Fuel for immediate use is stored in a 1000-gal. skid mounted tank. This gives enough fuel for approximately 24 hrs. operation. Arrangements for filling can be made in accordance with the local situation but if the fuel is delivered in drums, provision has been made for forcing the fuel from the drums into the tank using low pressure air from the starting air tanks.

Two cylindrical air tanks are mounted on the starting air skid. Superimposed on these is an air-cooled Quincy compressor powered by an electric motor or alternatively, in the case of a dead plant, by a Wisconsin gasoline engine.

During electrical operation, automatic controls insure maintenance of proper air pressure. Piping is complete, manifolding the tanks, and providing valves for individual tank shut-off, blow-down, etc. Safety valves are also included.

Muffler Assembly

A dry type Maxim silencer is used in conjunction with the engine. It is mounted horizontally above its skid in a manner that permits it to be raised to the operating height or lowered to the shipping position by the use of jacks. A pin and clamping arrangement on each of the four uprights holds the muffler in the desired position.

Switchgear Assembly

Like all the other functional groups the switchgear is skid mounted and fitted with all the necessary equipment to do its job and to facilitate interconnection with other assemblies. All of the necessary gear is enclosed against the elements as well as for safety. However, due to the necessity for ventilation of the transformers, etc., expanded metal construction is used on the bulk of the vertical surfaces behind the power panel.

The 4-ft. power panel serves to mount the generator and exciter controls as well as the synchronizing gear. Also included are the necessary Westinghouse meters and switches, one of the latter being an SRA type oil circuit breaker; a voltage regulator; and a watt-hr. meter.

The primary power equipment is located behind the power panel. This includes a 50-kva. 3-phase house service transformer, lighting transformer,

(*Continued on page* 81)

SHIPPING WEIGHTS, DIMENSIONS AND CUBE

Component	Dimensions (ft.) L	W	H	Weight (lbs.)	Cube (cu.ft.)
Engine-Generator Main Skid	38	7½	10½	75000	2324
Generator and Main Skid	38	7½	7	41000	1525
Engine & Shipping Skid	17	4	8½***	34000	799
Lube Oil Skid	9	7½	6	4600	416
Muffler Skid	12½	6½	9½* 11-3/4**	5280	279
Radiator Skid	15	7	5* 10**	5000	598
Starting Air Skid	7¼	3-3/4	4½	1500	95
Switchboard Skid	10½	4-3/4	7½	7600	370
Fuel Oil Day Tank Skid	11	4½	4-3/4	2520	252

* Height in Lowered Position

** Height in Raised Position

*** Height with Intake Silencer, removing silencer reduces this dimension

Standby Diesel Power for Ontario

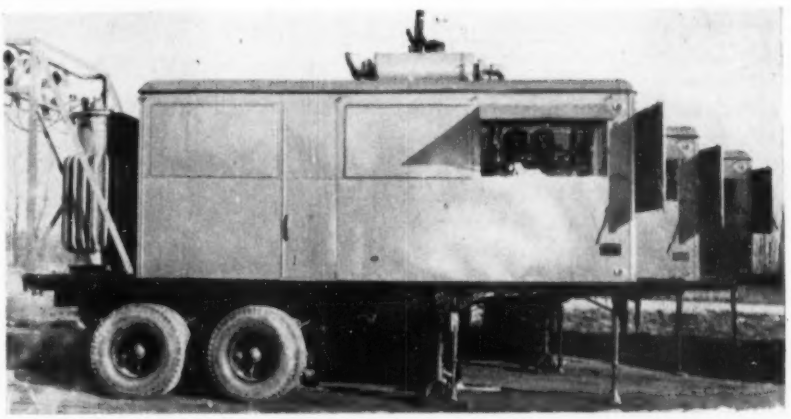
TRAILER mounted diesel powered standby power units are turning up all over Ontario and have attracted widespread interest in the province. The units are being used to provide power for the residents and industries of the area during the conversion of the power system from 25-cycle to 60-cycle electric current.

The conversion program has been undertaken by the Hydro Electric Power Commission of Ontario. It has been estimated that the program will take 10 years to complete and will involve modifications to every substation in Southwestern Ontario as well as the conversion of most electric motors in use.

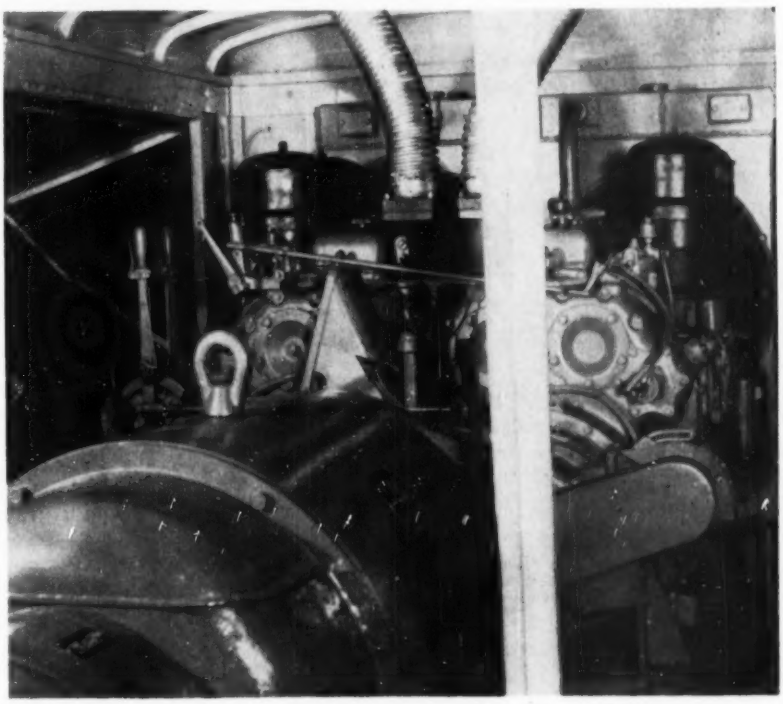
The change will simplify procurement of industrial machinery and home appliances as most of this equipment is designed for 60-cycle current. It will also permit an interchange of power between the U. S. and Ontario in time of emergency without the use of costly, elaborate frequency changing equipment.

The change-over is being accomplished in individual communities according to schedule. During the time that the conversion work is going on, power from the regular source of supply is cut off and the diesel powered standby rigs take over the power load.

The first generator units to go into this service were developed for Ontario Hydro Electric Power Commission by W. C. Becker Equipment Company, Ltd., General Motors diesel engine distributor in Toronto. As similar units enter the service, the project will gain momentum to hasten the day all Ontario will be on 60-cycle current.



Trailer-mounted diesel-driven generators which provide standby power during the conversion program. Note transformers mounted on the rear of the trailers.



Interior of the trailers showing the Twin-6 2-cycle diesels coupled to the generator with flexible couplings.

Each of the five standby generators now in service consists of a Canadian General Electric 200-kw. 80 per cent power factor, 3-phase, 600-volt generator with direct connected exciter at 1200 rpm. coupled by Link-Belt roller chain type flexible coupling to a General Motors model 12103 2-cycle diesel engine with 70 cmm. injectors. The engine is equipped with 1.33 to 1 reduction gears and governed for 1600 rpm. engine speed. Diesel engine, generator and a 250 Imperial gallon fuel tank are all mounted on a combination steel base.

The switch gear is of steel, shock mounted, and contains three demand ammeters, test links, voltmeter and switch, demand hour meter, synchrostat and switch, synchronizing lamps, air circuit breaker, field rheostat and voltage regulator. Transformer primary terminals are connected to the 600 volt 3-phase circuits leading from the back of the switch gear panel.

An interlocking switch, mounted on the transformer cover, can be set for a range of secondary voltages at 2300—4000—4600 or 8000. A demountable steel frame supports the final hook type switches and lighting arrestors. The generators are trailer-mounted to assure easy movement from town to town.

Diesels in Highway Transportation

by George W. Grupp

IN fleets of 10 or more heavy duty trucks the maintenance costs of diesel engines are not greater, and sometimes less, than that of comparable gasoline equipment. Even though the initial cost of diesel motor trucks and buses are higher than comparable gasoline equipment, yet they are generally more economical to operate because of their higher thermal efficiency.

One Class I motor carrier, who operates many gasoline and 235 diesel power units, said, "We regularly check fuel costs between gasoline and diesel vehicles with identical loads over identical routes. We find that the diesel vehicles save us 45 to 50 per cent on fuel costs alone."

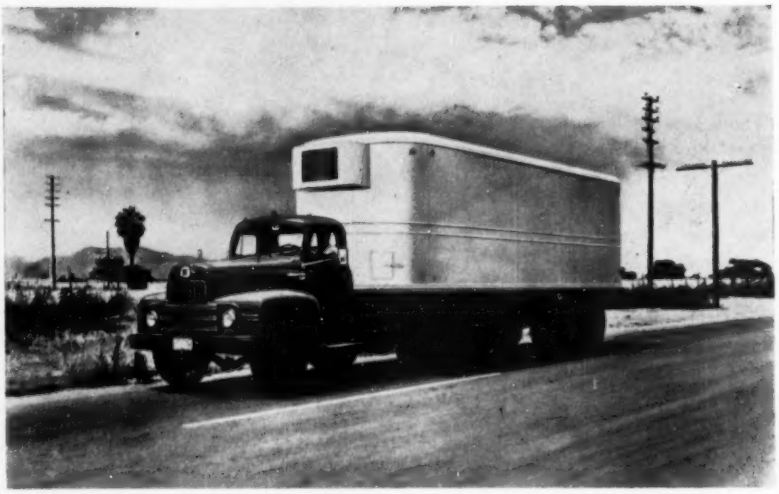
In 1949 out of the 500,000,000 bus-miles of intercity traffic of one system of bus lines, 53 per cent were diesel bus-miles. The gasoline buses of the intercity services of this one system of bus lines were only to average 4.7 miles per gallon of fuel as compared with 6.56 miles per gallon of fuel with diesel buses.

E. N. Hatch, formerly with the New York Board of Transportation, some time ago pointed out that the diesel buses of the city's transit system are more economical to operate than gasoline buses. In the congested urban traffic of New York City, the gasoline buses obtained 1.78 miles per gallon as compared with 2.91 miles per gallon for diesels.

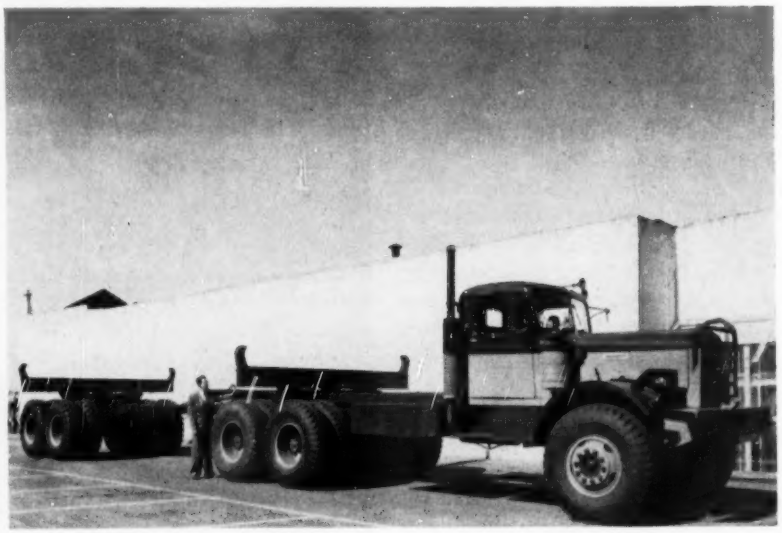
To demonstrate the ability of diesel engines for automotive equipment, Cummins made the first diesel truck endurance test in the United States in July 1931 between New York City and Los Angeles. The truck made a successful transit across the continent in 97½ hours with a total fuel cost of $11.22. To further demonstrate the ability of diesel engines Cummins made the first coast to coast diesel bus test in 1933. The 3200 miles across the United States were made in 78 hours.

Since 1940 the number of diesel powered buses, trucks and tractors used in highway transportation have steadily increased in total number. For example the factory sales of diesel trucks alone, according to the Automobile Manufacturers Association, increased from 4344 in 1946 to 6047 in 1949.

In an unwanted World War III, but within the range of future possibility, diesel trucks and tractors and buses are going to play an important part because military developments in wheeled vehicles are breath-taking.



Typical truck-trailer refrigerator combination. Rigs such as these are common on the highways of the Pacific Coast.



Heavy duty combination designed for lumber transport. Vehicles of this type can be used for both on- and off-highway hauling.

Classes of Owners

The three principal classes of civilian highway transport vehicle owners are common carriers, contract carriers, and private carriers. The private carriers use their vehicles to transport their own wares and personnel, or that of others for local carriage only. The contract carriers are authorized motor carriers for specific services. And common carriers are authorized motor carriers for the public

carriage of property and passengers over fixed routes.

The successful operation of the vehicles of these owners depends upon properly maintained good roads with adequate attention in winter to keep them free from snow and ice. A considerable share of this road maintenance and servicing equipment, is diesel powered.

Most large motor carriers equip their trucks and tractors with tachograph operation recorders which note all phases of a run. Some keep a monthly utilization record for each unit to enable them to properly appraise its performance.

Maintenance

The big motor carriers usually have their principal maintenance shops at centrally located points, and a number of auxiliary shops at other points along their routes of service. The main shops are equipped with the usual machine shop tools, with adjustable engine stands, with mechanical body washing machines with spray racks and motor driven revolving brushes, with brake dynamometers and axle hoists to test and adjust brakes, with electronic wheel balancers, with elaborate testing equipment, as well as with other facilities.

The preventive maintenance service of these motor carriers usually consists of specific services every 1500 to 6000 miles, and with a complete overhauling every 24,000 miles.

The Pacific Intermountain Express, a motor carrier which operates a large number of diesel power units, and who won the 1950 American Trucking Association's first prize for maintenance service, provides each unit with a safety kit and other operational accessories.

PIE keeps a log book on each power unit. In this log book a record is kept of each driver's trip report, and other inspection and operating data. At each inspection station along the route each driver's report is checked and adjustments made if possible. The inspector's findings and his maintenance services are entered in their power unit's log book, and a copy of his report is sent to the main shop. In the power unit's log book there is kept a chart indicating its schedule of regular maintenance services.

In addition to this, PIE keeps an equipment failure report on each vehicle. This report consists of the driver's analysis of causes for failure and of the repairs made enroute. These reports are studied by the maintenance superintendent to determine ways and means to avoid a repetition of similar road failures.

Conclusion

Presently, diesel power units are used by big motor carriers in practically all states of the Union, but the largest number of units are to be found in the Pacific and Rocky Mountain areas.

In the future, because of the fuel economy and other advantages, especially with heavy duty vehicles, diesel power units should steadily increase in number because the automotive field is one of the biggest potential markets for diesel engines since there are over 1,000,000 truck and bus owners who operate over 8,000,000 vehicles.

Factory Sales of Special Motor Vehicle Types From Plants in the United States

	1946 Total	1947 Total	1948 Total	1949 Total
Motor Coaches *				
City Type	N.A.	13,620	8,238	3,800
Intercity Type	N.A.	3,951	3,026	855
Special**	N.A.	1,539	1,035	856
School Bus Chassis	N.A.	30,431	23,755	13,896
Diesel Bus Production† (included in above figures)	2,311	5,133	6,277	2,479

N.A. — Not Available
* Does not include non-integral school buses
** Includes integral school buses
† Estimated by DIESEL POWER & DIESEL TRANSPORTATION
Source: Automobile Manufacturers Ass'n.

Motor Trucks and Buses

Factory Sales to Domestic and Foreign Markets from United States Plants

Year	Total Number	Wholesale Value*	Units Domestic	Units Foreign
1946	940,851	$1,043,247,276	753,830	187,021
1947	1,239,744	1,709,843,000	988,255	251,489
1948	1,376,155	1,858,210,000	1,173,115	203,040
1949	1,134,136	1,407,435,000	1,002,502	131,634

* Figures include substantial proportion of chassis only, hence values for bodies not included
Source: Automobile Manufacturers Ass'n.

Yearly Truck Production

Percentage of Total by Weight

Year	5,000 Lbs. and Less	5,001 10,000	10,001 14,000	14,001 16,000	16,001 19,500	19,501 26,000	Over 26,000
			Domestic				
1946	39.2	10.6	24.4	18.4	2.6	3.0	1.8
1947	32.4	17.1	19.7	21.0	3.6	3.8	2.4
1948	36.2	21.1	12.9	18.7	5.5	3.9	1.7
			Export				
1946	20.9	5.0	40.9	28.7	2.6	1.5	0.4
1947	24.4	6.7	27.8	34.9	2.8	2.4	1.2
1948	32.1	11.3	16.0	31.2	6.2	2.4	0.8

Source: Automobile Manufacturers Ass'n.

Factory Sales of Special Motor Vehicle Types

Trucks with Diesel Engines

Year	Domestic	Export	Total
1946	1961	2383	4344
1947	2605	3604	6209
1948	3684	2014	5698
1949	4885	1162	6047

Source: Automobile Manufacturers Ass'n.

Estimated Number of Diesel Trucks and Buses in Service in U. S.

Year	Buses	Trucks
1946	6,352	13,755
1947	11,485	16,360
1948	17,762	20,044
1949	20,241	24,929
1950	22,701	30,184

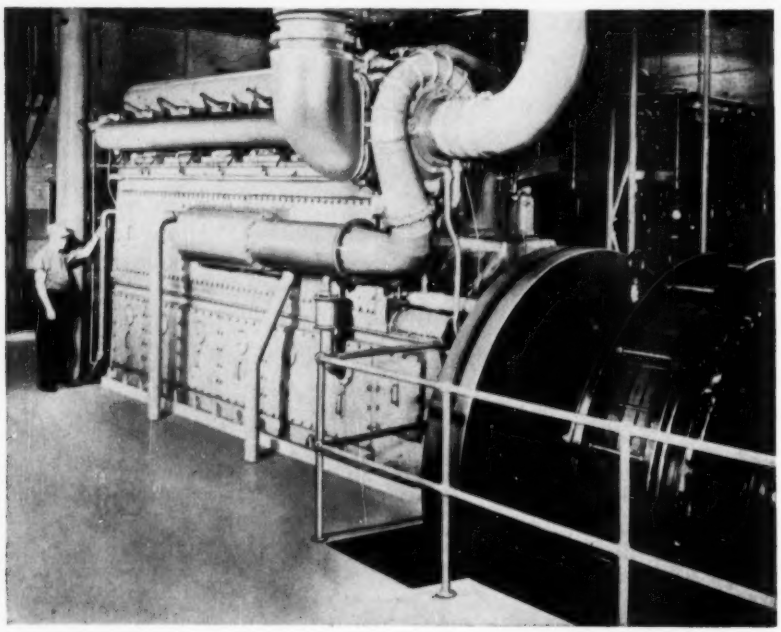
Estimated by Diesel Power & Diesel Transportation

Total Registrations of Trucks and Buses in United States

Year	Buses	Trucks
	Privately Owned *	
1946	119,937	5,725,692
1947	128,983	6,512,628
1948	133,372	7,225,706
1949	134,971**	7,692,569
	Privately and Publicly† Owned	
1946	173,585	5,986,081
1947	187,457	6,808,691
1948	197,495	7,553,656
1949	208,898	8,028,016

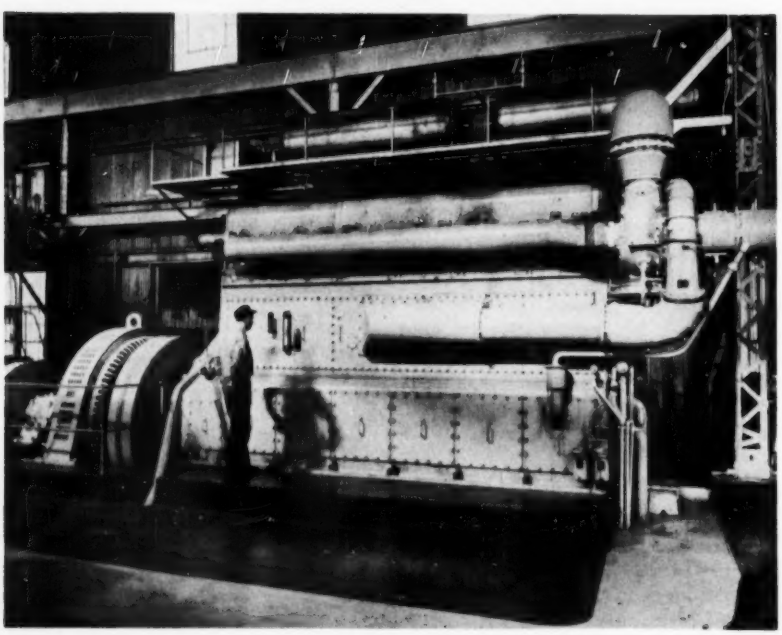
* Includes Municipally owned buses engaged in public transit
** School buses total 97,600 (bus transportation)
† Excludes military vehicles
Source: U. S. Bureau of Public Roads
All tables prepared by DIESEL POWER & DIESEL TRANSPORTATION

Intercooling Supercharged 4-Cycle Diesel Engines



This Nordberg Model FS-166-SC engine installed in the Menasha, Wisconsin, Municipal Plant is probably the first commercial installation to use the intercooling principle. Intercooler with attached piping is seen in center of engine.

One of the engines in the Arizona Edison Company plant, Miami, Arizona. Increased supercharging pressure made practical by intercooling eliminated the necessity for drafting to compensate for altitude and high ambient temperatures.



Next to improvements that added to the dependability and better performance of the diesel engine, designers have long endeavored to increase the power that could be obtained from an engine of given size and speed. To see the progress that has been made, it is only necessary to compare the overall dimensions, weight and output of an early engine with a modern diesel.

One of the more important advances made in obtaining increased power output was the application of supercharging. It is now common practice with most builders to supercharge 4-cycle diesel engines. The advantages of supercharging result from the fact that more air can be forced into the cylinder than is possible with a naturally aspirated engine and more fuel can be burned with a resultant proportional increase in power at no higher combustion temperature.

One of the factors that makes this possible is that a considerable amount of air cooling is obtained by allowing cool intake air to blow through the cylinder during a part of the exhaust and early part of the intake strokes, thus carrying more heat out with the exhaust. By increasing the power through supercharging, a given engine will have less weight per horsepower, more power for the space occupied, will cost less per horsepower for engine and its installation, and will have an improved fuel consumption over the entire range. In supercharging Nordberg diesel engines, an exhaust gas-driven turbocharger is actuated by the exhaust gases and takes no power from the engines.

There are two systems of supercharging — low pressure and high pressure. Only low pressure supercharging is considered here since it

is more commonly used at the present time.

Most modern design diesel engines, although structurally able to carry far greater horsepower, have reached the point where their safe rating for continuous service is determined by the ability of the surfaces in contact with the combustion gases to stand the temperatures without heat failure or destruction of piston ring lubrication. Non-supercharged, 4-cycle engines of modern design are rated at about 80 bmep., while low pressure supercharged engines operate at about 120 bmep. in continuous service. Many hundreds of thousands of diesel horsepower in successful service have proven these ratings to be conservative.

The Diesel Engine Manufacturers Association Standards provide that diesel engines shall be rated on the basis of 90 deg. F intake air conditions. To maintain the same average combustion temperature and heat load to the cooling water, it is necessary to reduce the engine rating about 3 per cent for each 10 deg. in intake air temperature above 90 deg. F. It follows therefore that engine rating can be increased about 3 percent for each 10 deg. in air temperature below 90 deg. F.

High intake air temperature affects the engine rating in two ways. First, there is less air available to burn the fuel because the density and weight of air in the cylinder decreases with increasing temperature; and second, the average temperature during the combustion stroke increases about two degrees for each degree increase in intake temperature. Thus, less fuel can be burned (less horsepower produced) before the maximum safe temperature is reached.

The low pressure turbo-charged diesel engine could be rated 15 per cent higher with equal conservativeness except for the fact that in increasing the air pressure to 3½ or 4 psi., the intake air temperature rises from 90 deg. F at the blower intake to about 140 deg. F at the blower discharge. Thus, the higher air temperature detracts considerably from the advantages of 3½ to 4 psi. air pressure.

It is obvious from the above that the next step in increasing the rating of a supercharged diesel engine is to cool the intake air after the supercharger. If cooling water is available at a temperature which will permit bringing the intake manifold air temperature back to 90 deg. F, the rating of the engine can be increased 15 per cent with no increase in average combustion temperature or heat load to the water jackets. This can be done by a simple, finned tube type of air-to-water heat exchanger built into the engine and through which the cooling water is circulated before going to the engine jacket water cooling system.

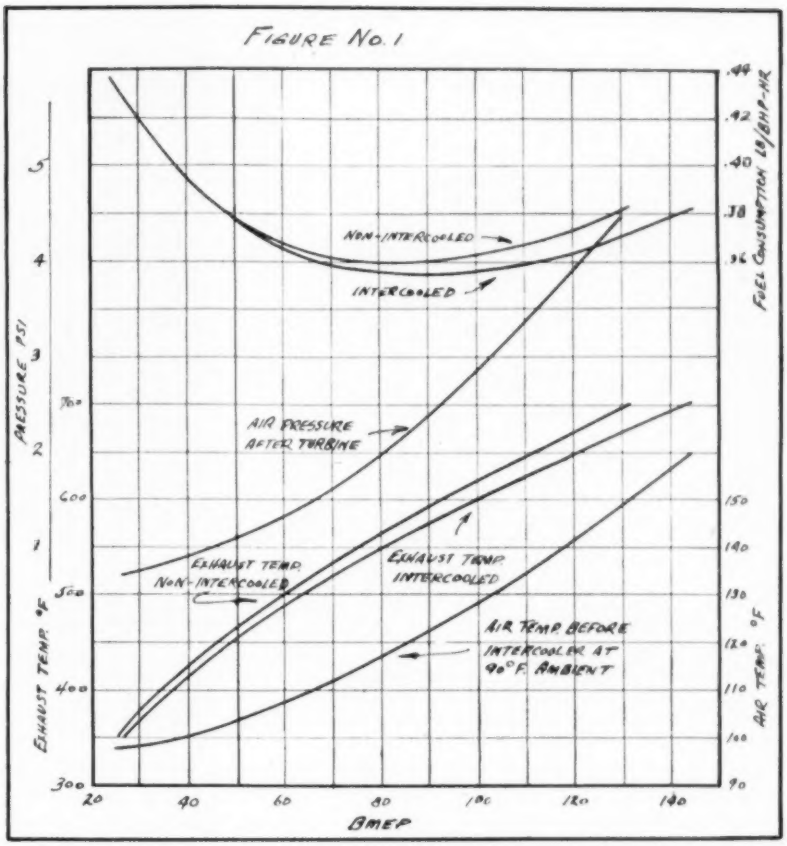
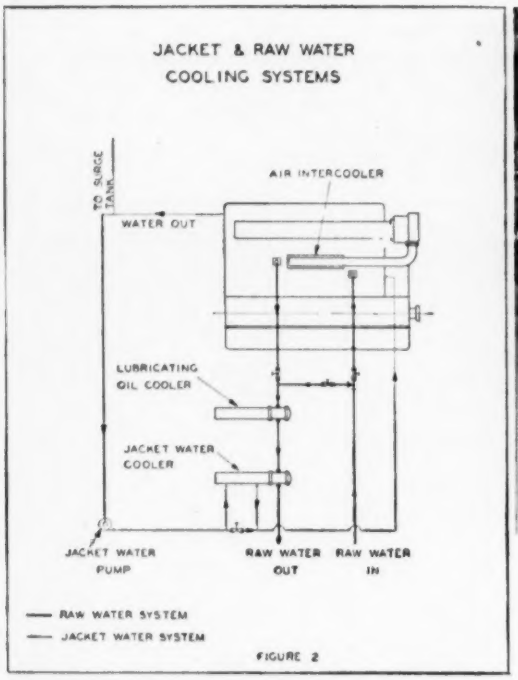


Figure 1. Representative curves showing the effect on performance of intercooling as applied on Nordberg 4-cycle turbocharged engines. All of the curves are referred to the abcissa representing bmep. As the result of this correlation, it is possible to make comparisons with respect to fuel consumption and exhaust temperatures under the two conditions of operation.

An economical design of intercooler will reduce the intake manifold temperature to within 15 deg. F of the water temperature. Thus, 90 deg. F water to the intercooler will result in 105 deg. F air temperature to the engine. Since the normal rating of the low pressure supercharged engine is based on 140 deg. F air temperature to the engine, the use of the intercooler permits an increase in rating of 10.5 per cent.

$$140° - 105° = \frac{35° \text{ F} \times 3\%}{10} = 10.5\%$$

While a non-intercooled engine must be derated for intake air temperature above standard conditions of 90 deg.F, the intercooled engine is independent of intake air temperature and its rating is determined by the water temperature to the intercooler. For example, a non-intercooled engine installed where summer temperatures reach 110 deg. F must be derated 6 per cent in horsepower. Under these conditions, the manifold temperature after the supercharger will be 163 deg. F. By applying an intercooler and using 90 deg.F cooling water, the manifold air temperature will be reduced to 105 deg. F. Thus, as in the preceding example, the engine can be rated 10.5 per cent above the normal rating for a non-intercooled engine operating with stan-



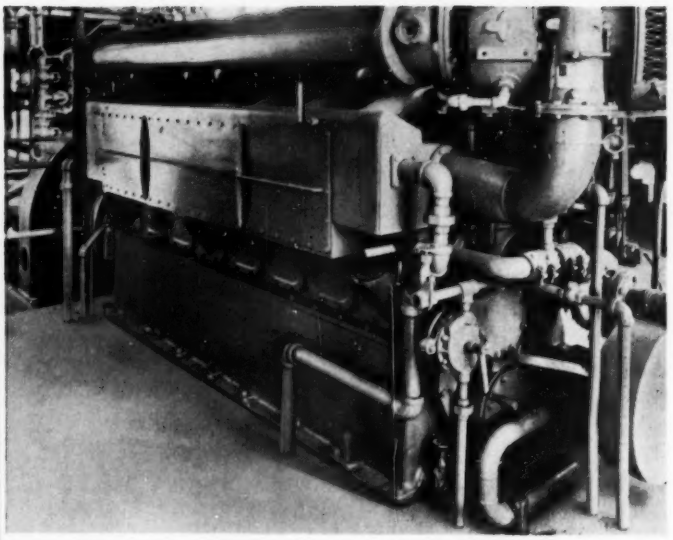


Figure 2, at left, illustrates a typical piping diagram for an intercooled engine. Above is another Nordberg engine fitted with a little different design of intercooler. This engine is installed at the Owens-Corning Fiberglas Corporation, Santa Clara, California.

dard conditions of 90 deg. F intake air.

The effect of supercharging and intercooling on the ratings of 16-in. bore, 22-in. stroke, 327 rpm., 4-cycle stationary Nordberg diesel engines is shown in the following tabulation:

No. of Cyl.	Non-Supercharged 80 bmep.	Supercharged 120 bmep.	Supercharged Intercooled 132 bmep.
5	730	1090	1200
6	875	1310	1440
7	1020	1530	1680
8	1165	1750	1920

The rating shown for the supercharged, intercooled engines is based on 90 deg. F water to the intercooler and 105 deg. F air temperature in the manifold.

The curves in Fig. 1 show the effect of intercooling on 4-cycle supercharged Nordberg engine performance. A schematic arrangement of the jacket and raw water cooling systems of a supercharged intercooled engine is shown in Fig. 2.

Typical application of 4-cycle supercharged and intercooled Nordberg engines are the installations at Menasha, Wisconsin, Municipal Power Plant, and the Owens-Corning Fiberglas Corporation, Santa Clara, California. At Menasha, a 6-cyl., 16-in. by 22-in. supercharged and intercooled diesel, operating at 300 rpm., has been in service since 1946. An 8-cyl., 9-in. by 11½ in. supercharged and intercooled diesel at Owens-Corning Fiberglas Corporation develops 720 hp. at 720 rpm.

At the Arizona Edison Company plant at Miama, Arizona, power losses due to both high altitude and high temperatures were compensated by the use of intercooling in conjunction with a slightly higher supercharged pressure. These engines are installed at an altitude of 3500 ft., which would normally require that they be derated 8 per cent due to the lower density of the air. An additional loss of 4½ per cent results from air temperatures of 105 water, would permit rating the engines deg. F during the summer. To compensate for these losses totalling 12½ per cent of the engine ratings, superchargers were designed to give higher manifold pressure.

While the higher supercharger pressure restored manifold air density to sea level conditions, it caused the air temperature in the intake manifold to increase to 133 deg. F. which would cancel all of the benefits of the higher pressure.

An intercooler using 125 deg. F water reduced the manifold air temperature to 140 deg. F. With air density and temperatures restored to normal sea level conditions, no derating was necessary. The same intercooler, supplied with 90 deg. F cooling at 10.5 per cent above normal rating for 90 deg. F air and sea level conditions.

There are many applications where intercooling can be used to provide an increase in horsepower at small additional cost and without any increase in space or foundation requirements. Water for intercooling can be either fresh or sea water. The latter is particularly advantageous where engines are installed on tidewater in tropical climates.

Flaw Detection Simplified

ONE of the well known tests for fatigue cracks in thin wall bearings is to dip the shell into gasoline or a penetrating oil, wipe it clean, and gently flex it. This action forces out the fluid that remains in the fissures that are too small for normal visual detection, locating them. But how do you flex a crankshaft?

A recently developed method of inspection offers a simple and effective means of conducting field tests on practically any suspected metal part, either ferrous or non-ferrous. The process is called *Dy-Chek* and was developed by Northrop Aircraft, Inc.

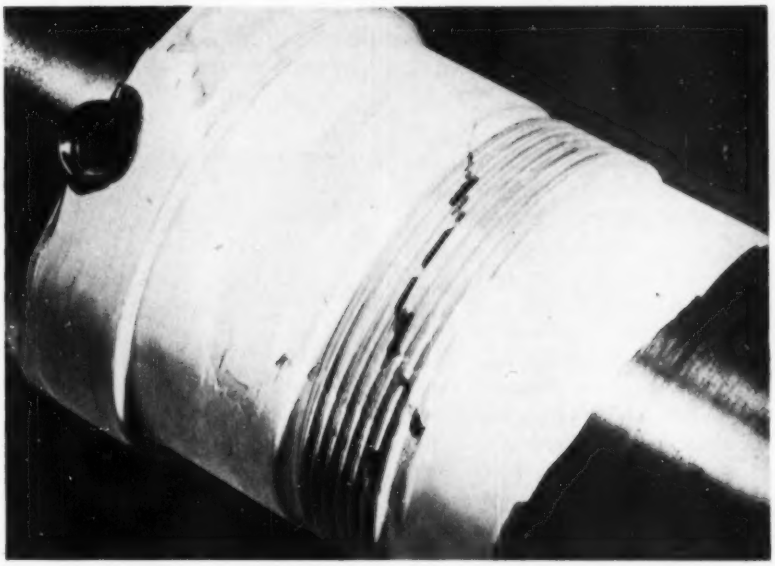
This process depends upon the controlled use of a red dye, together with other liquids, to indicate the presence of surface cracks or flaws too small to be seen even with a magnifying glass. The patented non-corrosive red dye penetrant is applied to the surface of the suspected part and allowed to stand for five minutes.

It is then wiped off with a special surface cleaner and dye remover, and a white "developer" solution is applied. Surface openings existing in the parts can then be detected by the presence of fine red lines or dots created as the red dye—possessing extremely high capillary action—is drawn from the fissure by the developer.

After thorough testing for 18 months at the Northrop facilities and at certain weld shops, foundries and forging plants, the process is now finding wide application in other fields. One particular use that points up a major advantage was Northrop's application of the process for inspecting high capacity gas turbines without the necessity for complete disassembly.

The simplicity and lack of elaborate equipment necessary for application of the process enables it to be used at the location of the suspected part. The only disassembly required is that necessary to expose the surface to be examined.

Once the surface is exposed and cleaned, the dye may be applied by any convenient means; brushing, spraying or dipping. The facility of application makes the process adaptable to either mass production or individual inspection. Inspectors can be quickly trained not only to locate any fissures but to estimate the size and probable depth of the defect.



Above—crack in aircraft crankshaft detected by use of the new process. Note jagged line through threads indicated by dye penetrant. Below—Technician using dipping method to inspect two valves for surface flaws.

So now, a new tool for inspection has been made available. The same technology that resulted in making higher stressing of parts possible, with consequent emphasis on critical inspection, has expanded the scope and improved the accuracy of the old principle of testing with penetrants and flexure.

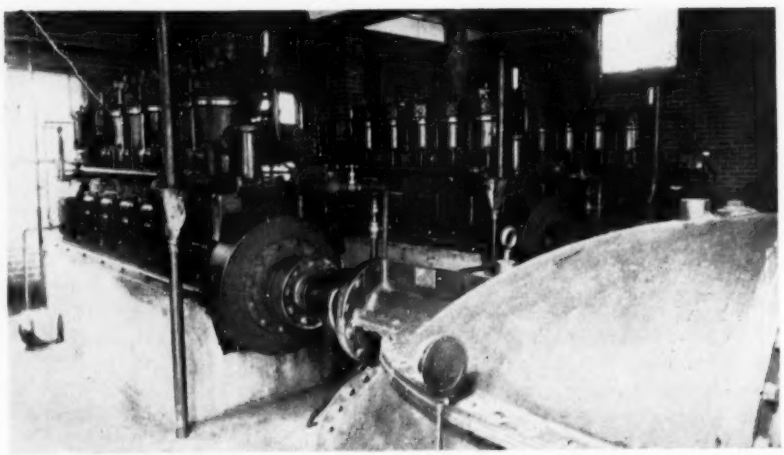
Diesel-Pump Team Cuts Drainage Cost

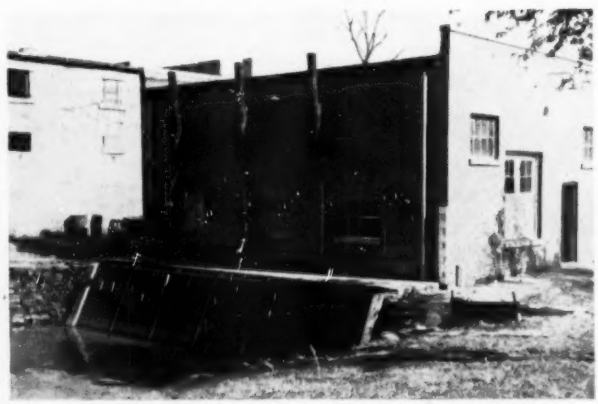
Missouri Drainage District protects farm lands with Fairbanks-Morse diesels and pumps at total cost of $.20 per acre-foot pumped

FOR 46 years the South River Drainage District, a few miles north of Hannibal, Missouri, has been working to protect its 10,000 acres of arable land against the ravages of uncontrolled waters. First task, when the district was organized in 1903, was to keep the Mississippi from flooding the land, so ten miles of levees were constructed. Next problem was the rainwater that coursed swiftly down the steep slopes to the West, water that was denied normal exit to the river by the new levees.

Since 1909 the district has pumped away this excess, first with two 100-hp. steam engines driving 36-in. pumps, with an additional 150-hp. of steam power installed in 1917, and finally with three 150-hp. Fairbanks-Morse diesel engines driving three 42-in. Fairbanks-Morse horizontal propellor pumps. In operation since 1936, the diesel-pump team has handled the drainage for an average of just 20 cents an acre-foot, the lowest operating cost in the district's history and well below the cost of alternate power sources.

A detailed summary of costs and pumping activity with the new equipment has been compiled by the U. S. Army Engineers for every year since 1939 when a new Mississippi dam raised prevailing river levels, obligating the Federal government to share pumping costs of the drainage districts. In the nine years from 1939 through 1947 the South River Drainage District spent $13,902.71 on plant labor, $8,658.22 on fuel, $3,274.90 on lubricants, $5,167.70 on maintenance, repair and supplies, and $2,302.82 on miscellaneous items, making a total operating expense of $33,428.27, an average of just $3,603.14 a year. Of course this figure is significant only in relation to the volume of pumping, and the period considered has been the heaviest in the recorded history of the river.





Interior of the pumping plant showing the three engines. One of the pumps can be seen in the right foreground. At right is the exterior of the station and below, left, can be seen the compressor which supplies starting air, and the fuel transfer pump, right.

In these nine years South River's diesels and pumps have handled 166,337 acre-feet of water with a weighted average static lift of 6.002 ft. Thus, the district has spent just $.00347 per acre-ft. per ft. of static lift, a saving of more than 60 per cent under the cost of operating the steam plant. The savings already have been great

South River Drainage District

Pumping Cost

Year	Labor ($)	Fuel Gals.	Fuel Cost	Purchased Power Kw.hr.	Purchased Power Cost ($)	Lube ($)	Supplies Maint. ($)	Misc.	Total
1939	770.60	8,507	486.86	1765	63.95	158.84	250.04	90.61	1,820.90
1940	679.60	2,866	164.02	1479	57.97	79.83	287.76	145.60	1,414.78
1941	914.40	8,686	494.19			126.74	136.25	227.37	1,898.95
1942	1,159.20	15,697	880.30			283.45	168.19	213.38	2,704.52
1943	1,417.94	15,899	881.61			327.36	294.87	235.75	3,157.53
1944	2,704.90	19,785	1,089.78			460.49	1,016.22	270.34	5,541.73
1945	1,963.86	25,333	1,389.88			584.33	238.76	325.95	4,502.78
1946	1,781.21	18,502	1,019.04			560.54	158.10	289.66	3,808.55
1947	2,511.00	30,279	2,252.54			693.32	2,617.51	504.16	8,578.53
TOTAL	13,902.71	145,554	8,658.22		121.92	3,274.90	5,167.70	2,302.82	33,425.27

enough to pay off the entire cost of the diesels and pumps.

Operating expenses was not the sole consideration, probably not even the principal factor that induced district landowners to purchase new equipment. The steam plant was old, inefficient and expensive, it is true, but more serious was its inability to pump against the higher stages of the river. Pump failure could mean the loss of a year's crops. It was decided to put up a new plant in 1936, a decision vindicated repeatedly during the high water years of the last decade.

In choosing equipment district engineers wanted versatile pumps that could handle the high stages and also pump efficiently at the low heads encountered through most of the year. The solution to this dual requirement was found in Fairbanks-Morse 42-in. horizontal propellor pumps with steel runners and split casings. This type of pump gives better than 85 per cent efficiency at 20-ft. T.D.H. and still provides nearly 80% at 12-ft. T.D.H.

South River wanted also the most efficient power supply available. Diesels were clearly preferable to steam. As for purchased power, the district had no experience itself, but across the river, Lima Lake Drainage District was paying an average of more than 2 cents per kw. hr. which meant more than $.059 per acre-ft. per ft. of static lift for power alone without figuring labor and other expenses. South River felt sure it could do better than that with diesels. (Lima Lake later installed Fairbanks-Morse diesels and pumps and reduced operating costs 61%.)

PUMPING DATA

Year	Days	Unit Hrs.	Acre Ft.	Weighted Static Lift
1939	56		10,151	5.44
1940	30	673	4,008	3.38
1941	79	1890	10,593	4.92
1942	124	3549	20,088	4.21
1943	135	3567	20,195	5.49
1944	153	4228	23,628	6.33
1945	142	5283	28,381	6.89
1946	115	3955	22,080	5.78
1947	117	5122	27,213	7.13
Total	951	28,267	166,337	6.002 Avg.

The engines chosen for the new South River plant were 5-cyl., 8¾-in. bore by 10½-in. stroke, Model 35 Fairbanks-Morse diesels, each rated 150-hp. at 450 rpm. Each of the three units drives a pump directly through an F-M flexible coupling.

Fuel oil is unloaded into two 10,000-gal. horizontal storage tanks by a 40-gpm. Fairbanks-Morse rotary pump driven by a 3-hp. F-M motor and then transferred by the same pump through edge-type filters to the engines' own supply tanks. Engines are lubricated with Standard Oil Company of Indiana's Nonpareil Heavy Duty Diesel Oil, Light. Lube is drained and replaced with new oil periodically. Engine-driven pumps draw cooling water from the canal, put it through the cylinder jackets and discharge to the canal. Thermostatically-controlled bypass valves keep jacket temperature at the desired level. The diesels are started with compressed air supplied by a motor-driven Fairbanks-Morse compressor. The plant also is provided with a priming pump, a Nash Hytor vacuum pump driven through a flexible coupling by a 10-hp. motor.

South River is fortunate in its pumping arrangement. The plant is located on the Bay de Charles, a six mile elbow of the Mississippi. The head of the bay now is cut off from the river by the levee which again cuts across the bay at the plant site four miles to the south. Thus, the four-mile section of the bay constitutes a reservoir into which the district waters drain. The plant pumps from the reservoir across the levee into the open section of the bay which empties into the river two miles further south. This arrangement is an important safety factor for the district and simplifies operations. The reservoir can be kept low and there is little likelihood that even the heaviest rains will outstrip the pumps and reserve capacity of the bay.

The district is managed by a Board of Supervisors: S. F. Schultz, president, James Matless, Claire Mings, Oney D. Bowen and Delbert Hartley. Enid A. Foster is secretary-treasurer and John L. Plowman, attorney. The plant is operated by G. F. Sultzman.

South River has been solving drainage problems for 46 years and seems now to have the right combination for dependable and economical service: a diesel-pump team.

Diesels Play Important Role In Public Health and Sanitation

by James Joseph

On thousands of dumps throughout the country diesel power is grubbing away, not a very glamorous job, perhaps, but necessary to sanitation and health. These dump-site diesels — bulldozers, draglines, shovels, dump trucks — play an important role.

An analysis of diesels on the dumps has recently been incorporated into a $20,000 report by the Los Angeles County Sanitation Districts. The 300-page survey, a year in the making, seeks to solve, by proposing a vast rubbish-collection and garbage disposal system, Southern California's pressing smog problem. Sanitation engineers have proclaimed it the most comprehensive report coming out of a metropolitan area in years. Diesels will play an important role in the proposal.

In brief, chief engineer and general manager of Los Angeles County's 19 sanitation districts, A. W. Rawn, found that for about $17,000,000 the districts could instigate their own home collection and public garbage disposal — a job now handled by private contractors and by more than 350,000 home incinerators. The aim of the proposed plan is to wipe out these home incinerators which are unusual for a population area as large as Los Angeles County. The reason: smog control officials estimate that the hundreds of thousands of such incinerators are the greatest single contributor to the area's overlying smog.

The $17,000,000 collection system would set up 18 land-fill and incinerator salvage centers to bury and to burn refuse from the county's 1,700,000 homes.

Diesel power and how it can effectively handle dump operations comes in for much discussion in the report. Diesel power is also closely tied-in with cost estimates. In estimating the total per ton cost to bury refuse or to burn it in county-owned incinerators, the survey reports that land-filling costs total about 80 cents per ton, once the refuse has been delivered to the dump site where heavy diesel earth-moving equipment is used. This 80 cents per ton, using diesel power, is compared to $2.00 a ton for incineration in specially-built combustion chambers.

Several special attachments have been made for use on bulldozers assigned to dump land-fill. Among these is a bull-clam — a bulldozer with a special type of clam bucket attached to the dozer blade. It not only pushes mountains of rubbish before it, but can actually take big bites out of the rubbish pile, transferring material economically to the burial site. The bull-clam combines the functions of bulldozer and shovel.

Another device is a bulldozer blade with extended "wings" — in effect, dozer blade extensions set out at a 45-deg. angle from the dozer blade — which boosts the dozer's scooping efficiency.

In Rawn's report, which gathered landfill and dump site information

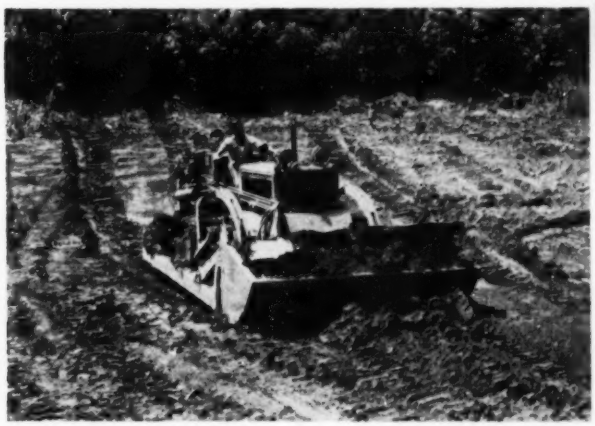
Dozer at work on, fill-and-cover dump near Duarte, Cal.

Bull-clam International diesel used for trenching and covering in Riverside, Cal.

from the entire nation, diesel power was found to be used almost exclusively for heavy refuse moving jobs at the dump site, and also for earth-fills after burial of refuse.

In what kind of dump operations do diesels fit? There's the "cut and cover" and "fill and cover" methods. "Cut and cover" means that diesel power must first doze or otherwise excavate pits, then fill with refuse, the final step being to push a layer of dirt over it. In "fill and cover" operations, refuse is dumped into natural depressions, usually a ravine or gully. The refuse is then compressed and compacted by running tractors over it. Then more diesels move in to cover the dump with earth borrowed from adjacent hillsides.

Diesel powered tractor with wings attached to dozer blade. Rig is used on refuse dump near Riverside, Cal.



International diesel tractor with bull clam covering refuse.

In a typical "fill and cover" operation, refuse is deposited and compacted in lifts of from 6 and 10 ft. in length, with intermediate layers of dirt about two ft. thick. When a land-fill dump reaches final grade level — and thus is full and no longer useful for dumping — a top cover of from 2 to 6 ft. of earth is dozed over it. This provides a base for planting to lessen erosion and subsequent pollution of the surrounding area.

"Cut and cover" operations require more diesel power, and thus are not as economical as the easier "fill and cover" method. The Rawn report found that many cities without nearby gullies or ravines have turned to "cut and cover" — usually excavating a dumpsite by bulldozer and dragline — although it is costlier.

El Paso, Texas, for instance, uses the "fill and cover" system in a deeply eroded area six miles from the city, and at the same time practices the "cut and cover" method at another disposal site on the Rio Grande near the city limits. Diesel power is used for both operations.

Riverside, Calif., employs bull-clams for primary trenching and covering at its "cut and cover" sanitary fill. Another dozer with "wings" handles refuse. Duarte, Calif., uses a "fill-and-cover" system at an abandoned gravel pit. Diesel power again is the motive force behind this operation. These are, of course, but two of thousands of similar operations throughout the country.

The Rawn report has further analyzed the two types of operations across the nation. It has found that in either operation, conducted on a small scale "only bulldozers or bull-clams are used for excavation, compacting and covering." For more extensive "cut-and-cover" operations, it is sometimes more efficient to use a dragline for excavating and covering. Large scale "fill-and-cover" lay-outs are making effective use of scrapers and carry-alls to load and spread earth cover over the compacted refuse.

In analyzing refuse disposal methods the nation over, the Rawn report found that some kind of diesel power was used in almost every case, usually in the last operational stage. Operational costs vary across the nation depending upon location and magnitude of operation. In almost every case the portion contributed by the use of diesel equipment is one of the lowest single factors in the entire operation.

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Mid-Town Power Plant Solves Expansion Problems

by E. A. Thibodeaux
City Engineer

Municipal growth inevitably presents problems to those responsible for supplying electrical power needs. The means by which these problems are solved depends on the particular situation, but one problem is invariably common to all growing communities. That problem is how to expand within existing walls.

The city of Thibodaux, La., faced and overcame this obstacle and at the same time developed a more efficient and economical operation. The story of the Municipal Utilities of Thibodaux involves other problems that are common to many, if not all municipalities. With the plant located in the very center of the city — adjacent or very close to the court house, hotel, school administrative offices and playground—cleanliness and quietness of operation became an absolute prerequisite to any plans of operation or expansion. In addition, growth of local industry and increasing availability of natural gas as a source of fuel presented their own unique problems to the city.

Thibodaux was able to meet these changing conditions, and since 1917 has seen the capacity of its power plant increase from 170 kw. to its present day level of 2945 kw., all without burden to the taxpayers and without outside aid. This expansion was accomplished with only one building extension, in 1941, to allow installation of a second 1170-hp. unit.

Other units at the time consisted of a Fulton 200-kw. air injection unit installed in 1917, and a MacIntosh and Seymour (Alco) 385-kw. unit added in 1929. Through maximum use of available space it was possible to increase capacity still more with an American Locomotive Company 1080-hp. unit in 1949.

The period of most rapid expansion was between 1938 and 1941 when the two 1170-hp. engines, both supplied by Alco, were installed. During these and the following years, Thibodaux came face to face with the problems of limited space, a mid-town location, and growing availability of natural gas. An outline here will describe the steps taken to overcome these problems.

In 1938, natural gas was being piped into the city from nearby Louisiana gas fields. The city had elected to build its own gas distribution system and purchase the gas wholesale for resale to private consumers. When the first 1170-hp. engine was installed in that year, consideration was given to both straight gas engines and convertible engines. However, the supply of gas was not believed firm enough to use straight gas engines and the cost of gas compared to liquid fuel did not warrant the use of convertible engines at that time. In addition, it was more profitable to sell the available gas to domestic consumers than to burn it in the engines.

The 2185-kw. plant (1941) carried the community through its wartime demands without any interruption. Service was maintained even though the load was up considerably and very little standby capacity was available, a record not uncommon in many municipalities at the time.

After the war, defense industries closed down in the area but the power requirements continued to climb so that by 1949 another unit was necessary.

How to get this additional capacity without raising the noise level or expanding the existing plant became paramount considerations. Community plans to build a new city hall in the playground and park adjacent to the plant only aggravated the problem. The community had become accustomed to the noise from the plant, but it was agreed that any additional units must not increase the noise level.

Also at Thibodaux, as elsewhere in the country, the price of fuel oil had jumped sharply after the war while the price of gas remained stationary. The supply of gas was more stable, as well, and the decision was made, not only that the new engine must be a dual-fuel unit, but that existing engines should be converted to dual fuel operation where possible. The two 1170-hp. engines were converted by Diesel Modification, Inc., in 1948, and savings of approximately $2000 per month were realized.

The 12½-in. by 13-in. Alco engine installed in 1949 was a turbocharged, 1080-hp., 760-kw., 600 rpm., dual-fuel unit.

The engine will operate either on all fuel oil or fuel oil and natural gas. The type of fuel may be changed without shutting down the engine or removing the load. The engine is operated on fuel oil when starting and can be shut down when operating on either fuel oil or fuel oil-gas combination.

Natural gas supplied to the engine passes through a valve reducing pressure from the main gas line as required, and a surge tank is provided in the gas supply line. Control and safety shut-off valves are provided. A Woodward UG8 governor controls the volume of gas entering the engine, according to the load, by a special balanced-control valve. The gas supply header distributes the gas to the individual cylinder heads by branches extending through the air inlet header to a point close to the inlet valves at which point the gas and air mix.

The manufacturer assured the city that the installation would be neat in appearance, reliable in operation and designed to provide adequate working space on each side of the new unit. Space was available only between the

two existing 1070-hp. engines. Dimensions of this area were 28 ft. long and 16 ft. wide, and the Alco unit fitted nicely in this space.

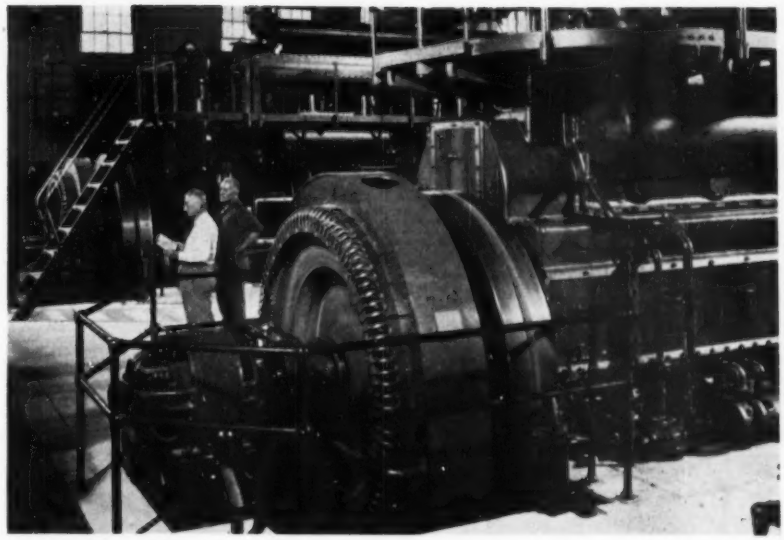
Noise level of the existing engines was estimated at between 90 and 92 decibels and an acoustic hood was installed on the new engine so that this level would not be exceeded. The hood, which covers the engine from the turbocharger at the free end of the engine to the flywheel, has three access doors, a ventilating fan, a lucite door adjacent to the fuel pumps, governors and gas control valves.

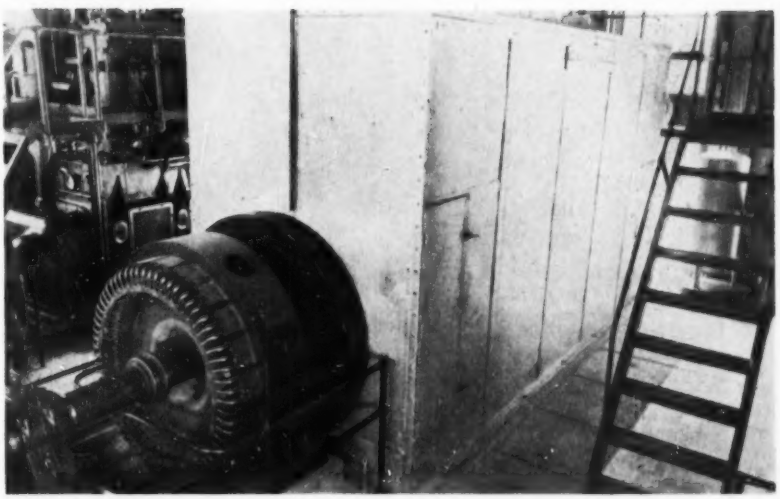
The ventilating fan is located in the top of the hood at the flywheel end of the engine. Air is drawn across the entire engine through a grating located over the lube oil cooler and extending into the engine room proper. It was feared that this opening would allow noise to escape but such was not the case, and the hood is thoroughly ventilated and cooled in this manner.

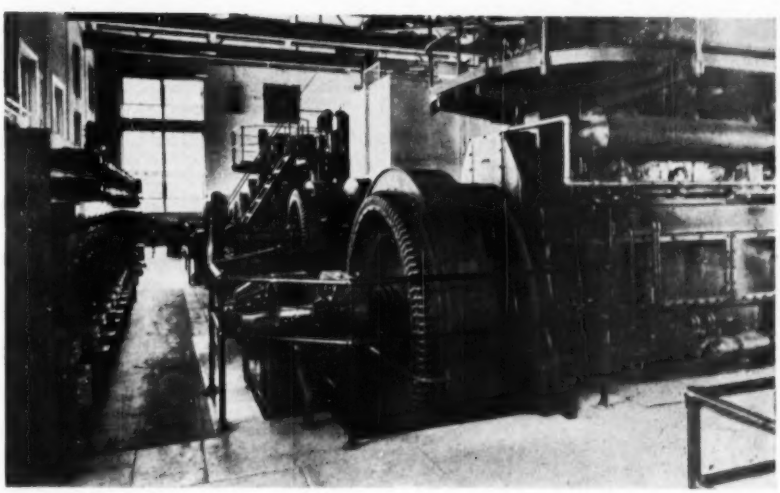
For normal adjustment or minor maintenance, the operator can go inside the hood; but for major overhauls, the acoustic hood is removable. Approximate time for removing the hood panels and exposing the engine is one-half hour. The accompanying table shows decibel meter readings taken at various places and with various combinations of engines running. The new unit with acoustic hood is the quietest in the plant.

The city of Thibodaux, the capital of Lafourche Parish, is situated at the mid-point of the "longest street in the world" — Bayou Lafourche — which runs from Donaldsonville in the north 110 miles to Grand Isle on the Gulf of Mexico. The city dates back to the arrival from Nova Scotia of the Acadians in south Louisiana and is the site of Rienzi, the beautiful plantation home built in 1796 for Queen Marie Louisa of Spain.

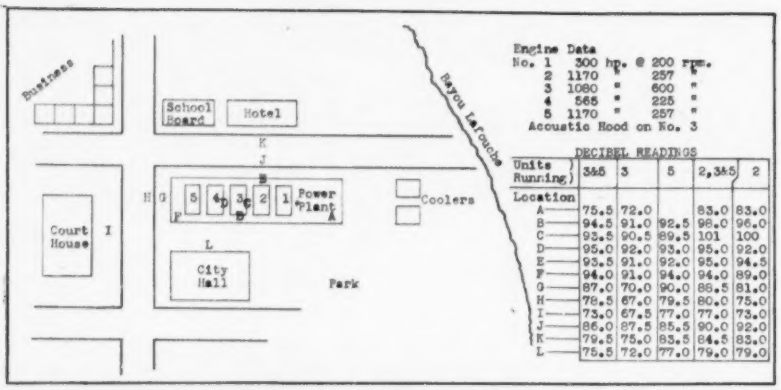
Thibodaux's Municipal Utilities came into existence in 1895 with a water plant and some steam pumps on the banks of the bayou. In 1898 a dc. steam driven generating unit was added to the water plant and served until 1910. At this time the system was changed from dc. to ac. and two "large" 120-hp. diesel engine powered generating units were added.







(top to bottom) Engineer Thibodeaux and assistant standing in space where new engine equipped with acoustic hood was installed. The new engine with hood is shown in the middle photo and a view of the engine room with the new engine is shown at bottom.



Engine Data
No. 1 300 hp. @ 200 rpm.
2 1170 " 257 "
3 1080 " 600 "
4 565 " 225 "
5 1170 " 257 "
Accoustic Hood on No. 3

DECIBEL READINGS

Units Running	3&5	3	5	2,3&5	2
Location					
A	75.5	72.0		83.0	83.0
B	94.5	91.0	92.5	96.0	96.0
C	92.5	90.5	89.5	101	100
D	95.0	92.0	93.0	95.0	92.0
E	93.5	91.0	92.0	95.0	94.5
F	94.0	91.0	94.0	94.0	89.0
G	87.0	70.0	90.0	86.5	81.0
H	78.5	67.0	79.5	80.0	75.0
I	73.0	67.5	77.0	77.0	73.0
J	86.0	87.5	85.5	90.0	92.0
K	79.5	75.0	83.5	84.5	83.0
L	75.5	72.0	77.0	79.0	79.0

Schematic drawing of portion of Thibodeaux showing relative location of power plant, City Hall, etc. Table gives decibel readings at location on drawing.

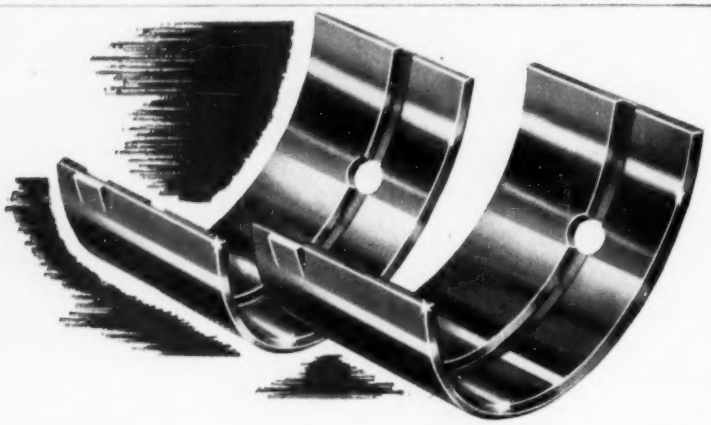
In 1917 when the present management took over, the two diesel engines would not parallel owing to poor plant arrangement. Within five years the plant and distribution system was renovated and the Fulton 200-kw. air injection diesel unit was installed.

Within seven years, the steam engines were disposed of and the plant became a full diesel operation with the addition of a 385-kw. McIntosh & Seymour (Alco) unit. By this time the electric plant had become the biggest business in town and through the depression largely supported the other municipal services.

When the diesel plant was first put into operation, Bayou Lafourche water was used for cooling. The water was allowed to run out of the bayou into the plant, located on its bank, and then back again. In those days, it was believed that an engine should be kept very cool—120 deg. F. was considered hot water. Feeding the brackish bayou water directly to the engines resulted in the necessity for cleaning the engine jacket and renewing pipes and pumps every two or three years, since barnacles and scale built up on the internal surfaces of the engine.

In 1938, when the first 1170-hp unit was installed, a new cooling system was developed whereby jacket water was cooled through shell and tube heat exchangers, and the scale was allowed to build up only in the exchangers and raw water pumps and piping. This system worked fairly well on both 1170-hp. units except that the operators had become so accustomed to running the engines cold over the years that they bled city water into the jacket water, resulting in some scale.

When the new 1080-hp. unit was installed in 1949, it was decided to install either a cooling tower or an air-cooled heat exchanger for the entire plant. Two Alco air cooled heat exchangers were selected. They have a capacity of 8,380,000 Btu. per hr. each and are equipped with thermostatically controlled two-speed fans. They are located approximately 80 ft. from the plant on the banks of Bayou Lafourche. Fouling has been eliminated and with a controlled increase in water temperature, efficiency of the old engines has been increased.



Master Engine Mechanics Prefer MONMOUTH

TODAY'S Diesel power plants in marine, vehicle and stationary use are the finest engines of their type ever built.

Master designers and makers of these fine engines specify and use only top quality components, including CGB bearings of the proper type and construction.

Should bearing replacement become necessary, master engine mechanics maintain the high standard of engine performance with Monmouth Bearings. These bearings are identical in every detail with the original bearings. They excel all others in finish, in precision, in quality and in engineered performance.

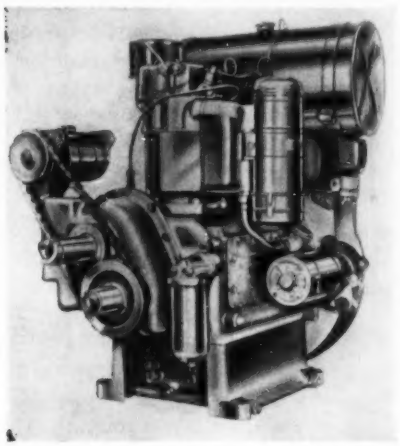
In the maintenance of Diesel engines—whether marine, stationary, or in prime movers—specify genuine Monmouth Engineered Bearings.

Monmouth Bearings are engineered and precision made to safeguard the reputation of the master Diesel engine mechanics and to insure user safety and satisfaction.

THE CLEVELAND GRAPHITE BRONZE CO.
REPLACEMENT SALES DIVISION
6545 Carnegie Ave. • Cleveland 3, Ohio

Small Air-Cooled Diesels

TWO SMALL air-cooled diesels have been introduced to the American market by Lister-Blackstone, Inc. They are intended to answer the demand for small engines for such service as cement mixing, electric power generation and powering farm machinery, pumps of all types, brick crushers, compressors, etc. The two models have been in service in other parts of the world for some time and have been under test in this country for several months. A complete spare parts inventory has been established in this country by Lister-Blackstone. The engines are made by Armstrong-Siddeley, Ltd.



Two-cylinder 20-hp. air-cooled diesel looking from the free end of the engine.

The two models are essentially the same design, the major difference being that one has a single cylinder while the other has two. The latter is rated 20 hp. at 1800 rpm. while the former is rated at 8 hp. at 1200 rpm. The engines are "square" having a bore and stroke of 4¼ in. The 4-cycle engines have a compression ratio of 15 to 1.

One of the most important aspects of the new models is the air-cooling system. Air-cooling offers several advantages over conventional cooling systems. The most important advantage to be gained is that there is no need for the operator to be concerned about cooling system maintenance. Also, the danger of freezing in cold climates is eliminated.

The engines have been tested at very high and low ambient temperatures and tests indicate that the cooling system is satisfactory in every respect. It is to be noted that a committee of engineers has recommended to the Armed Services that they convert to air-cooled engines for their operations, especially where the equipment is to be used in very cold climates.

Performance charts for the larger engine are promising. Curves for torque, bmep., and fuel consumption follow the normal pattern. Torque ranges from 73 to 58 ft.-lbs. over the speed range of the engine. Bmep. roughly follows the torque curve ranging from more than 90 at its peak to 72.5 psi. at maximum rating. Fuel consumption ranges from about 0.38 to 0.45 lbs. per bhp.-hr. across the speed curve.

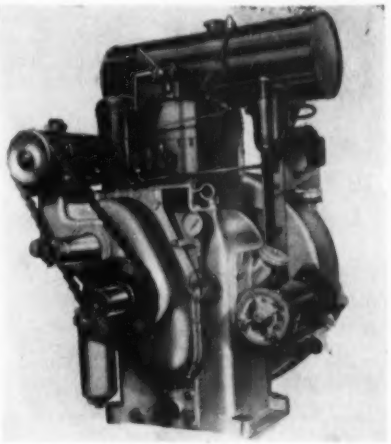
The crankcase has been designed with an eye to simplicity. Inspection doors of light alloy steel give ready access to the bearings. The crankcase, head, cylinder barrel, lower foundation and flywheel are of cast iron.

In casting, fins are formed on the exterior of the cylinder head to give greater area for heat transfer from the cylinder. The flywheel casting contains vanes which, at operating speeds, cause the flywheel to act as a centrifugal fan, directing a flow of cooling air through a cowl to the cylinder fins. Part of this air is diverted through a set of tubes in the oil sump to cool the lube oil and maintain it at proper operating temperatures.

The crankshaft is machined from a high-grade tensile steel forging and is fully counterbalanced. Pistons are light alloy castings with specially-designed dished heads. Three compression rings and three slotted oil-control rings provide compression sealing and lube control in the cylinder. One of the oil-control rings is located below the wrist pin. The latter is full floating and is held in the piston by a snap-ring at either end.

Silchrome valves operate in cast iron valve guides which are a press fit in the head. Main bearings are steel-backed, babbitt lined. Con rod bearings are of the same type except that the top half of the bearing is made of indium lead bronze. The con rod eye bushing is made of hard phosphor bronze. The camshaft is of case-hardened steel and is supported by three babbitt-metal bearings.

Speed control is provided by an adjustable centrifugal-type governor. The fuel system is by CAV. The fuel injector is mounted on the head between the two valves at a 25-deg. angle and is equipped with a special three-way spray-hole nozzle, providing maximum turbulence to aid combustion.



One-cylinder 8-hp. engine of the same basic design as the one shown on the left side of page.

All bearings are pressure-fed by a gear-type oil pump fitted in the front of the crankcase and driven by a spur-gear engaging with the crankshaft gear wheel. The lube is filtered through a gauze strainer from the sump. Oil passages in the crankshaft carry oil to the mains and con rod bearings. Cylinder walls and wrist-pins are splash lubricated with oil from the con rod bearings.

The engines are equipped for standard electric starting, including Electric Auto-Lite starting motor engaging a driving ring on the flywheel and a belt-driven generator. The engines can also be hand-started using a starting handle supplied as standard equipment. A compression release valve is provided for hand starting.

DIESEL BRIEFS

Radio Controls Ford's Railroad

Railroad traffic over the 105 miles of track in Ford Motor Company's Rouge plant will soon be directed entirely by a two-way radio-telephone communication system. The Rouge railroad, largest industrial system in the world, is one of the first private lines so equipped. Ten of the company's 19 diesel electric locomotives are equipped and the remainder will be within a year.

Four years of experimentation with equipment and methods preceded installation, and license to operate was granted last April by the FCC. The special control tower seen above is the brain center of the system.

Ford officials expect improvement in over-all efficiency, expedition of movement of freight cars in and out of the yard and speedier execution of all switching orders.

During June the railroad handled 27,189 cars in and out of the plant and an additional 75,581 within the plant. Switching orders average over 2600 per week or about 520 per 24 hours.

Flexitallic Distributors

Flexitallic Gasket Company announces the addition of three new distributors and two new agents to its field organization.

Tate Engineering & Supply Co., Inc., Baltimore, Md., is a new Flexitallic Distributor and will serve Maryland and Washington, D. C.

A. L. Crump & Company, Chicago, Ill., will serve northern Indiana and Illinois.

Carl Grimes & Company, Des Moines, Ia., will serve western Iowa.

Frank Valetti & Company, Philadelphia, Pa., will serve the Marine industry within the limits of Philadelphia.

Southern Marine Supply Company, Inc., Savannah, Ga. will serve the Marine industry within the limits of Savannah.

Transmission Engineering Co., San Francisco, Calif. is expanding its service to include the Marine industry in that area.

Eagle Asbestos & Packing Co., New Orleans, La. will now serve both Industrial and Marine industries in eastern Louisiana and southern Mississippi.

N.Y.C. Bus Garage Opens

The $10,792,000 bus garage and shop constructed to store and service buses operating on fifteen municipal lines in Brooklyn and Queens has been put into service according to the N. Y. Board of Transportation.

The new buildings have storage space for 311 buses and shop capacity for a fleet of 2000 vehicles. They are located between Bushwick and Jamaica Avenues and along Fanchon Place in the East New York section of Brooklyn.

Champlain Buys Pickering

Champlain Company, Inc., has just announced the acquisition of the business of the Pickering Governor Company from the Hartford Empire Company, Hartford, Conn. Champlain officials stated that the Pickering line of governors will be complementary to the manufacture of Champlain's line of heavy machinery for the graphic arts industry and that the sale and further development of governor products will benefit through the new parent company's manufacturing and technical facilities.

Aboe Expands Warehousing

Implementing its expanded program of distribution and customer service, ABOE, Inc., New York, has considerably increased stocks of its Petter engines warehoused at strategic points throughout the country, company officials recently disclosed.

Heretofore, the main supply of engines has been concentrated in New York. Now, extensive stocks have also been provided in New Orleans, La., Houston, Tex., Los Angeles and Berkeley, Calif., Portland, Ore., and Seattle, Wash.

The new supply policy, it was reported, is being promptly reflected in increased sales by distributors and dealers, and will be expanded in the interest of better service as rapidly as the growth of the distribution structure warrants.

Federal-Mogul Active

Operations in the Detroit plant of the Federal-Mogul Corporation are already higher than they were before the company's eight months strike,

DIESEL BRIEFS

the Corporation recently announced in a note to stockholders.

With the note went dividend checks payable December 11 to stockholders of record on December 1, 1950. The checks included a quarterly dividend of $0.40 per share and an extra dividend of $0.40 per share.

According to the notice, operations in the company's Detroit plant "are larger now in dollar volume and manpower than immediately before the strike started.

"Full credit for this fine recovery is due to the energetic activity of our sales force, the skill and efficiency of our manufacturing division, and the cooperation that we have had from the Union."

ABM Warning

A warning that storage battery prices will have to be increased if any additional import tax on lead is again imposed was issued at the recent fall meeting of the Association of American Battery Manufacturers in Chicago.

This danger was pointed out by H. A. Harvey, president of the Association and of the Auto-Lite Battery Corp., who presided at the meeting. He cited the dependence of American battery producers on imports of foreign lead and stressed that re-imposition of the import tax (suspended during the war) would bring very moderate revenue to the government but would materially increase lead prices to the manufacturer.

Association members attending the meeting also heard Dr. W. W. Leigh of the University of Akron forecast that the market for replacement storage batteries will increase by 10 per cent in 1951.

RDC'S for Australia

The Budd Company has received an order for three Rail Diesel Cars through its Australian representative, Commonwealth Engineering Co., Ltd., for the Commonwealth Railways of Australia, H. A. Coward, Budd vice president, announced recently.

"It is the first order placed for these self-propelled, all-stainless steel cars by a foreign railroad and was recommended by P. Hannaberry, commissioner of Commonwealth Railways, who is now visiting this country," Mr. Coward said.

"The order is regarded as significant by Budd since these will be the first RDC's to go into service in Australia and may be the forerunner of considerable business in that country," he added.

The RDC's for Commonwealth Railways will be of the standard type heretofore purchased by six leading American railroads, which are in widely diversified service throughout this country.

Van Norman Sales Meeting

At the recent Automotive Service Industries Show held on Chicago's huge Navy Pier, Van Norman Company had the largest exhibit in what has come to be the largest trade show held anywhere in the world. On exhibit and in operation were 30 Van Norman automotive service machines from small cylinder boring bars to giant crankshaft regrinders. Preceding the ASI Show, vice president and sales manager Charles R. Crowder called in all Van Norman district managers from coast to coast, and convened them in a 3-day sales meeting.

Engine Installation

Just 59 days after The National Supply Co. purchased assets of the engine division of Atlas Imperial Engine Co. of Oakland, Cal., this Atlas engine was ready for shipment from National's Engine Division at Springfield, Ohio. In this short time, National Supply shipped patterns and tools more than 2000 miles, made castings, did all machining, assembling and testing, and dismantling the engine for shipment to the Philippine Islands where it will be put to work at the Narvacan Power Plant. The engine, one of three identical naturally aspirated diesels bought by the Atkins, Kroll Co. of San Francisco for the Philippine station, is a six cylinder model which develops 350 horsepower.

Maintaining Engine Cooling Systems

*by Edward C. Uecker**

Copper is one of the latest materials to undergo controls. There is only one reason — limited supply. Prudent operators will do well to consider the implications and start to give or give extra attention to vital heat transfer equipment — NOW. Here are some of the important things to know and do.

IN late years increasing attention has been paid to the care of the cooling systems of engines. Why has it become such an important problem? One reason is that in the course of years when the power plant became greatly enlarged in capacity, the radiator cooling the engine remained approximately the same size in frontal area. In fact, in many cases the height and width of the radiator has been decreased and obstructions in form of grilles, shutters, etc., placed in its way, and yet this radiator has to cool an engine often of 30 to 50 per cent greater bhp. than its predecessors.

This required drastic redesign of the radiator and construction of the core. The endeavor to expose the maximum amount of surface to water and air circulating through the core, agitate or turbulate the air for greater heat transfer, and other changes required to take care of the increased horsepower have by necessity complicated the problem of maintaining the cooling system in proper working order.

The small tube passages are easily clogged by impurities in the water; scale, rust, lime deposits, particles held together by grease and oil, or foreign materials in general. The air passages have become smaller and smaller and in many types are unable to pass solids through odd and uneven shapes of fins or secondary surfaces. In addition to this, where formerly six fins per in. was considered good design, modern radiator cores have as many as eight, nine and sometimes ten fins per in. This acts like a screen or filter for the air forced through the core and leaves miscellaneous deposits ahead of and within the air passages.

Forced water circulation increases the heat transfer capacity of the core, but unfortunately also speeds up corrosion, erosion and corrosion due to aeration. New constructional materials and their alloys have created new problems appearing as accelerated corrosion due to the dissimilarity of metals and intensified electrolytic action.

Before considering the proper servicing of the cooling system, it behooves us, therefore, to investigate the causes of failures. The original determination of any trouble will be indicated, in most cases, by the water temperature. We must always remember that the radiator is the thermometer for the engine and while improper temperatures do not necessarily indicate cooling system trouble, it is quite natural to search there first.

Now what might be the source of trouble? The trouble may originate inside the system and may be difficult to analyze. The causes also may come from outside sources. In order to discuss the problem in a systematic manner, let us start with the inside disorders.

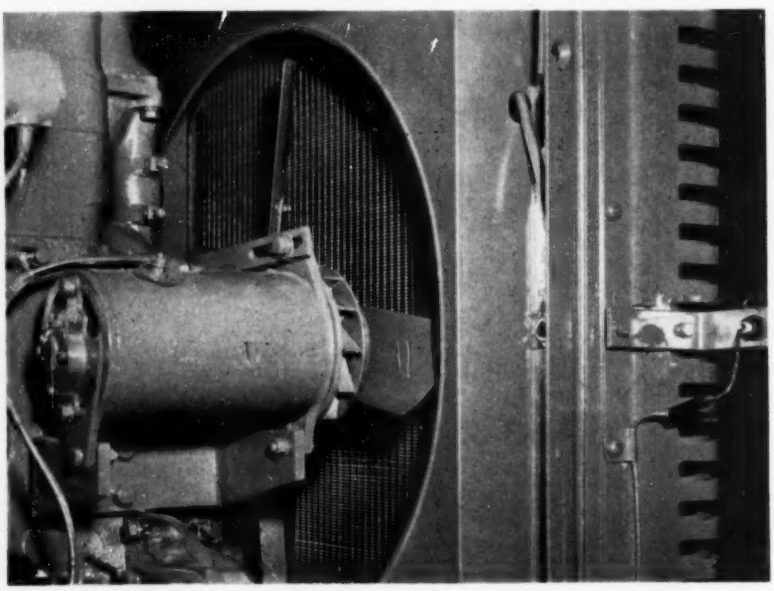
Water Suitability

Out of our experience as a cooling system manufacturer we have found the source of water, its treatment for hardness and corrosion resistance and radiator cleaning to be basically important factors in the proper operation and life of the cooling system.

Water almost always needs some form of treatment before it is fit for industrial use as well as home use. Certain characteristics are of interest from the standpoint of use in cooling systems and are mentioned below. Only visibly clean water, free from sediment, should be used in an engine cooling system.

Scale forming characteristics or

A clean, well kept cooling system. Note location of fan in shroud.



**Young Radiator Company, Racine, Wis. Abstract of a paper presented at the Motor Vehicle Fleet Maintenance Institute at the University of Wisconsin, Madison, Wisconsin.*

"hardness" are due to the bicarbonates and sulphates of calcium and magnesium salt. The bicarbonates are referred to as "temporary hardness" factors and the sulphates as "permanent hardness" factors. Boiling will precipitate bicarbonates from solutions and will form scale and sometimes sludge.

Corrosion characteristics of water are very important. Such water is sometimes encountered in rivers and small connecting lakes and is usually due to improper disposal of industrial waste.

Water may sometimes contain hydrogen sulphide. This substance has the "rotten egg" smell and such waters are extremely corrosive to copper and copper alloys (common radiator metals). Natural water supplies may often contain carbon dioxide caused by contact with decaying organic matter, and which is in itself corrosive.

Oxygen is one of the more active elements and is exceedingly corrosive to iron and steel. It is introduced as part of any air which is entrained in surface waters such as lakes or rivers as the result of atmospheric contact during turbulent flow or weather conditions. Shallow wells also may contain dissolved oxygen.

Scale

Unless proven to be "soft" by analysis, cooling water should be obtained by regulation distillation equipment, condensation of live steam or chemical exchange apparatus. It is not only possible but probable that even such waters will be corrosive.

Pure lime deposits in a cooling system are relatively rare, but when encountered present a very difficult problem in their removal. Most scale deposits are both a mixture of lime and rust that have been deposited on the metal. It is possible that a cleaner that is capable of dissolving rust could be used and also thereby loosen the lime.

Types of Corrosion

Oxygen and iron become iron oxide process of corrosion. A continued supply of oxygen from outside, therefore, will support corrosion and must by all means be prevented. Oxygen present in the water is liberated by heating and boiling. Small bubbles of the gas cling to the metal walls of the cylinder jackets and in conjunction with carbonic acid gas attack the iron jackets and other parts in contact with the water.

Oxygen and iron become iron oxide or rust. This rust is washed away by the passing water, exposing new surface to the oxygen. At low velocity points, a scale may develop and finally break loose, slowly piling up in the radiator tanks, water passages and tubes.

Sludge in bottom radiator tank possibly from gasket and/or oil cooler leaks.

Most oxygen, however, is introduced with air from the outside, and here we have effective ways to avoid this supply of air and hinder the otherwise corrosive attack. We must, by periodic inspection and by adjustments, try to prevent air infiltration. The main points causing excessive aeration are at the water pump and the hose connections.

Water pump packing should be kept tight at all times. A leaking pump should be repaired immediately or defective parts replaced. A slight leak will be sufficient to pass large quantities of air causing greatly accelerated corrosion attack. This attack will usually occur at a point of impingement or where velocity is extremely high.

Some water pumps create at times a high vacuum at its suction side and a defective hose connection may pass large amounts of air. In order to lessen the suction, the radiator connections should be as large as possible and unrestricted.

An opinion is oftentimes given that a high suction is necessary to overcome radiator core resistance. The fact is that ordinarily the total area of water passages is many times greater than the radiator connection pipe and pump suction line. Therefore, a great amount of suction can be avoided by making these connections much larger or of sufficient capacity to avoid this known evil.

Another source of aeration is in the top tank of the radiator. The tank should be sufficiently large and provided with suitable distributors or baffles so that the water is always as quiet and level as possible. These baffles and water distributing means should distribute the inrushing water evenly over the entire width of the core. A minimum of an inch or more of water should cover the tube ends at all times so that there is no chance of sucking air into the tubes or passages.

Other items are aids to corrosion. Bad design of the cylinder blocks and water jackets may produce hot spots at certain points due to unevenness of metal or sluggish or greatly impeded water circulation. At other points, due to general design and bad distribution, steam pockets may form

especially at the far end of the cylinder block. There the water will boil and foam; lime will be boiled out and oxygen and carbon dioxide gas will be formed in large quantities. With increasing deposits heat transfer becomes less effective, and water temperatures higher; all accelerating the chemical processes.

It will be noted that corrosion is not merely a matter of time, but rather depends upon the kind of service. More miles driven, greater speeds, and harder service will tend to increase corrosion activities.

Engineers and power plant authorities agree that the cooling system should be periodically cleaned of these rust and foreign material accumulations. As mentioned, mileage and service conditions, speed of the vehicle, engine rpm., atmospheric conditions, kind of water used, etc., will definitely affect the frequency at which this cleaning operation should be performed. In truck, bus, tractor and power unit engines that operate day after day, cleaning, check-up and inspection should be frequent, perhaps weekly, depending on conditions of service, type of unit and other factors attendant.

Another form of corrosion, electrolytic, takes a prominent place in cooling system failure. We all are aware of the simple battery made up of a zinc and copper plate put into a glass container filled with acid or salt solution. In course of time the zinc plate is eaten away, the chemical energy transformed into electrical energy.

Similar galvanic cells are formed when other dissimilar metals are used, some more, some less active. Arranged in electrolytic order are copper, brass, lead, tin, iron, solder, zinc and aluminum following one another. The farther the metals are apart in this list, the greater the electrolytic action. Note that copper and aluminum form a very active couple.

Practically all the metals mentioned are used or are present in the cooling system. The metals are joined by solder or other metals which serve as electrical conductors or in the case of alloys, the small crystals of the different metals mixed constitute small batteries; the water serving as the electrolyte. Practically all waters contain salts of some form or other or are slightly acid, sufficient to establish galvanic action. In some cases, the cooling water is contaminated by cleaning compounds or anti-freezes left in the radiator.

A source of acid forming gases is combustion gas leaking into the cooling water jackets through defective sealing at the juncture of the cylinder head and block. Such gases discharged into the water will provide it with a variety of acids, such as carbonic, nitrous and sulphurous acid, all supporting electrolytic corrosion.

Appearances of Corrosion

Corroded sections of radiator tubing or other material of the cooling system may present the most curious designs. In some instances corrosion may be in the form of grooves which may be attributed to expansion and contraction strains in the metal during the process of corrosion, and these points will be more rapidly attacked.

It may be in the form of pits or etchings in the radiator tube wall, small conical depressions located side by side, or in the form of small round holes which are attributed to dezincification. By dezincification is understood the preferential removal of zinc from brass or alloys by electrolytic action due to the presence of strong alkalies and certain salts.

There is also uniform corrosion, often unnoticed, resulting in uniform reduction of the metal thickness. Other forms are possible, as for instance, embrittlement, which as is known in boilers, is ordinarily caused by an over-supply of caustic soda; graphic corrosion, etc.

Erosion of parts is often experienced. It may be considered a combination of corrosion and aeration occurring mainly at high velocity points of the water system, within the pump housing, sharp turns, projecting parts, and so forth. The prevention of erosion is mainly a matter of design, although curbing of aeration will materially reduce erosion.

Protective Devices

A corrosion inhibitor should be used at the very beginning of engine operations. Water soluble inhibitors are generally used, and there are two general types: the "one shot" treatment for small and medium size installations where supervision may not be readily available; and the simpler chemicals suitable for use on large installations and which require constant supervision and control. The former is typified by costlier complex compounds and the latter are typified by the chromates and dichromates which are low in cost but which require frequent periodic solution checks.

There are other types of so-called inhibitors and corrosion preventing devices which only do a partial job or function only under the most favorable conditions and yet from time to time enjoy considerable popularity.

Sacrificial metallic corrosion inhibiting devices (zinc pencils) have been in use for a great many years and have been tried in all types of services. However, in engine cooling systems, uniform protection is impossible and although localized protection is often shown for a short time period, these devices cannot protect the inaccessible parts such as the inside of the radiator tubes, the cylinder liners or the jackets where the protection is really needed. They do not soften the water and they cannot control the pH (chemical activity) nor affect any of the constituents in the water or in the water itself.

Soluble oil is also sold as a corrosion inhibitor. This is really an emulsion of oil and water and unfortunately it often becomes demulsified, that is, the oil separates from the water. This may be caused by hardness of other general constituents normally found in water or by heat. When demulsification occurs the oil forms a gummy mass which deposits in the radiator, in the hoses, and in the cylinder block and which rapidly accumulates suspended matter and other foreign material and builds it into a good insulating thickness. Even in emulsified forms soluble oil will attack and soften the natural content of rubber hoses, often "plating" this out in an inert form on the cooling surface of the radiator and it is practically impossible to remove this either by chemical or mechanical means.

Grease and Oil Destruction

Formation of scale and sticky deposits is helped along by outside factors, especially by oil and grease being forced into the cooling system by oilers or grease cups on the water pump. Overgreasing, particularly at high pressure, will force a liberal quantity of grease into the pump bearing where it will work into the pump and mix with the water.

The grease is later found on top of the radiator core and within the tubes mixed with scale, iron oxides and other matter. By sticking to the tube surfaces and preventing the transfer of heat, the aggregate partially or completely plugs the water channels. Simple flushing does not easily remove grease and oily substances. Hose connections to the radiator deteriorate in course of time and particles of rotted lining and rubber break loose and get into the cooling system.

Numerous other things may disturb the radiator system, as for instance the use, over-application or misapplication of cleaners, rust preventatives, bad anti-freezes. By far the worst effect is the deposit of the products of corrosion.

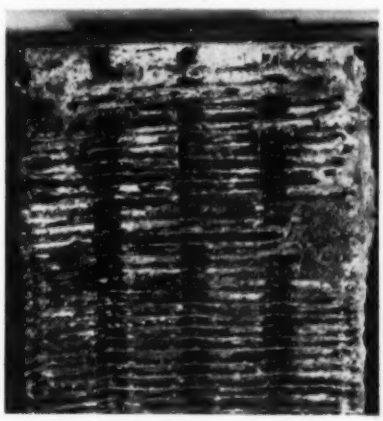
Radiator Cleaning

On older systems the presence of rust and/or sludge in the water indicates that cleaning is necessary. There are many types of cleaners available and the inhibited acid type has found general favor due to simplicity and safety of use.

The better "one shot" inhibitors also contain softening ingredients and are the best answer for the smaller system. These can be added to almost any water and are effective for approximately six months. However, in heavy truck, tractor and bus service, this period should be decreased in accordance with operating conditions and type of service. The cooling system should be drained and flushed at each renewal.

In cleaning a cooling system which is already in operation, a good acid-type cleaner is the safest and most effective. Our cooling system cleaner combines oxalic acid with sodium bisulphate along with an alumina-silicate inhibitor and a "wetting" agent. This effectively penetrates various deposits in the system. Oils and greases go into suspension permitting easy removal.

Rubber and rubber compounds are not harmed by these ingredients. Complete cleaning can be accomplished in one draining and flushing and it is not necessary to perform the operation a second time for "neutralization." After proper cleaning corrosion inhibitor should again be used.



Example of obstructed airflow

During this cleaning process the hose connecting the radiator with the pump and engine block should be removed and the radiator and engine block flushed separately. The radiator should be flushed with the water entering at the bottom connection that is in reversed order of regular flow. In this manner impurities are more easily dislodged and removed. In the same manner the engine block should be flushed from the top against the regular flow of water. Hose connections should be inspected and replaced if necessary. Thermostats, of course, should be removed before the flushing operation.

At all times the water pump deserves a thorough inspection, worn parts should be replaced and good working order assured. The fan belt may require tightening and the fan should be inspected for bent blades or other defects.

General Considerations

From a service standpoint it can be seen that tight cylinder head joints, the use of natural soft water and prevention of aeration will serve to reduce corrosion. When inaugurating the engine into service the cylinder head bolts should be pulled down, the pump should be inspected to make sure that the packing is tight. The fan belt should be reasonably tight. After seasons of the use of anti-freeze, the radiator and cooling system must be thoroughly rinsed and cleaned. This also refers to any hot water heaters if such are used and connected with the system.

In larger trucks and practically all tractors using cast iron tank type radiators, the complete radiator core is fastened to tanks by bolts and can be readily removed and replaced in servicing.

In passenger cars, trucks, buses, and small power units where the tanks are usually of stamped or formed sheet metal and soldered to the core or tube sheet, the entire core and tank assembly can be removed and replaced. The replacement radiators or sections, of course, should be identical to the ones being replaced in reference to cooling capacity, air-resistance, water passage, etc. The replacement cores should be obtained from the original manufacturer or from a source responsible and experienced in radiator design and manufacture.

Purchase of a so-called inexpensive or cheap units in the majority of cases will not allay your troubles. The replacement core should definitely check in capacity, tube and fin surface, and should show a complete solder bond between tube and fins (or prime and secondary surfaces) which is very often overlooked.

Exacting modern machinery is required to make a good radiator core, as well as trained mechanics and expert workmen.

Selection of a suitable radiator core is not merely a matter of size and cooling capacity. Usually operating conditions and territory is taken into account by the manufacturers and a core is selected with wide water passages, for instance, where contaminated waters are experienced or expected. Wide fin spacing is used when the air is found to contain dust of a particular kind of quantity or other foreign materials to be encountered in field service. These facts should be known from a service standpoint.

Centrifugal Re-Babbitting

Centrifugally cast babbitted bearing shells are commonplace to-day. Many of the bearing manufacturers use this process with conspicuous success. The bearing material is dense and homogenous and, due to controlled cooling, spinning speeds, etc., segregation of the metallic components, cold shuts and other irregularities are avoided. Where such bearings are supplied as original equipment in an engine, and replacements are available, there is little problem. Some owners and operators of diesels, however, do not have the advantages of this type bearing.

Older engines, those of foreign make, and some having journal sizes or types for which these centrifugally cast bearing shells are not readily available, fall in this category. When bearing replacement is necessary the practice for many years has been to statically cast the new bearing metal. The practice has been very satisfactory, providing that the job is properly performed and carefully controlled, although sometimes lacking the load carrying capacity of the centrifugally cast metals.

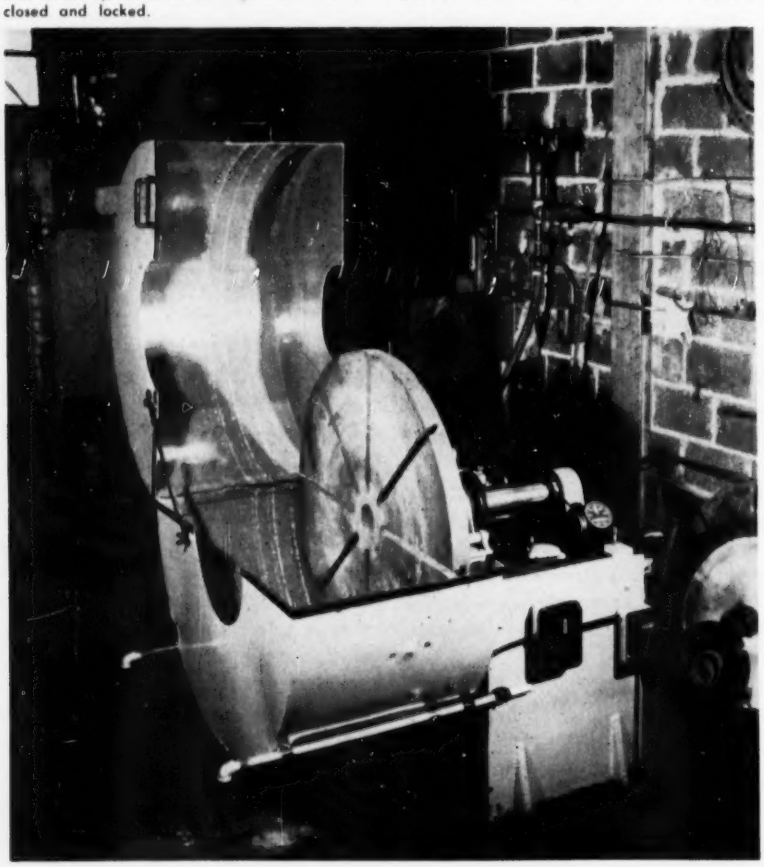
The basic problems of re-babbitting, whether static or centrifugal casting is used, include bonding and the avoidance of such irregularities in the material as cold shuts, segregation of the components, crystalline structure and slag inclusions. Centrifugal casting accentuates the possibility of some of these, for example, segration of the component metals on the basis of specific gravity due to centrifugal force.

A major problem in centrifugal re-babbitting is the equipment needed and the "know-how," with particular regard to spinning speeds and cooling. Bearing manufacturers have solved the problem to a nicety, but re-babbitting in the field is something else. For one thing, the variety of bearing sizes that turn up in repair shops creates the necessity for equipment to handle a wide range of sizes.

An example of an ingeniously designed machine for this purpose can be seen in the shops of Sigurd Golten, diesel repair specialist, of Brooklyn. Catering to the marine repair field in New York harbor, it is natural that he gets a fairly large share of repair on engines falling in the category mentioned where replacement bearings are not readily available.

The machine is basically a device for turning a face plate at various controlled speeds, arranged to facilitate pouring, and provided with a water chilling system. The bearing shells or boxes serve as the mold and are centrally mounted on the face plate.

Centrifugal casting machine shown in casting position. Machine is tilted 90 degrees to enable workmen to set up forms for casting. It is tilted to the position shown for operation and the hood is closed and locked.



During original manufacture of bearing shells, the bearing backs are in the form of a tube which is sawed in half and trued after the casting operation. In this case, the shells are already parted and the halves must be held together tightly or properly shimmed and clamped. A series of clamps, shims, end-plates etc., have been worked out for assembly to the shells so as to provide the properly shaped cavity. These provide for the flange type bearings as well.

Bearing shells or boxes for re-babbitting are first heated to remove the old metal and to drive out any residual oil. Any further traces are removed by a caustic bath followed by thorough washing. Tinning to create the bonding layer is the next step. Careful attention is required to see that the surface is completely covered by the block tin used. It is applied to the heated surface using flux and a hand torch. When a thin uninterrupted layer is in place, the bearings are ready for re-babbitting.

Tilting is a feature of the machine

and this permits the shells, shims, clamps and end-plates as needed to be assembled with the face plate in a horizontal position. After this operation, the face plate is tilted to the vertical. Irregularly shaped bearing boxes and the fixtures used with shells sometimes create an out-of-balance situation. A simple and effective means of counterbalancing the face plate is provided so that the desired rotational speeds can be obtained without incurring excessive eccentric loading.

Babbitt suitable for the particular job at hand is heated and maintained at the proper temperature, usually to 800-850 deg. F for the tin base alloys, in a melting pot of suitable size. A pyrometer continuously indicates the temperature of the molten metal.

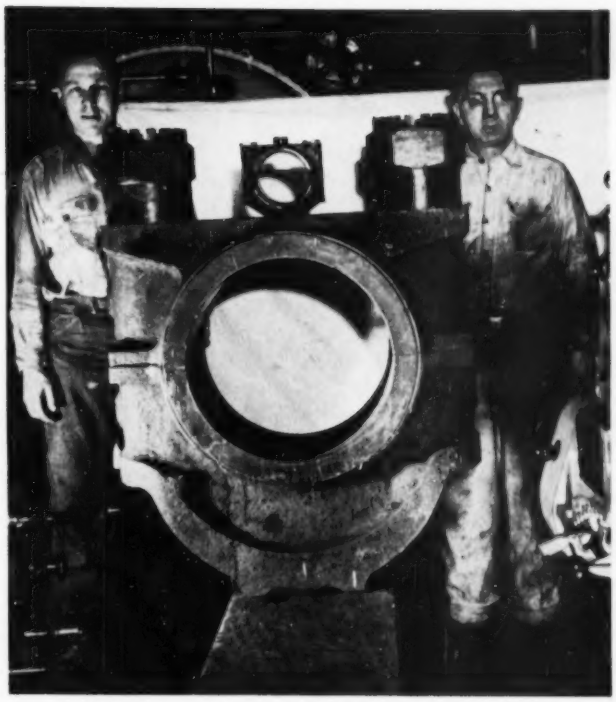
The machine is started and brought up to the desired speed. The optimum speed is largely determined by experience but in general, speeds will decrease as sizes increase. The centrifugal force developed is fairly critical; if it is too high, the components of the alloy will separate or laminate on the basis of specific gravity; if too low, bonding will suffer.

It is necessary to heat the bearing box, or shells as the case may be. The outermost end plate of the assembly has a circular hole in its center through which the bearing metal is poured. A gas torch with a clean non-oxidizing flame is set up so as to heat the assembly that constitutes the mold. Heat is applied during spinning until the temperature is about 400-450 deg. F as shown by a surface type pyrometer or by borax.

The latter is a fairly good and convenient indicator, since it will start to smoke in this temperature range. Its principal application is with shells where the constant section of metal throughout the circumference promotes temperature uniformity. A pinch is dropped into the cavity and no harm is done should there be any excess since borax is a good flux.

When everything is ready, a preheated guide spout is placed to facilitate pouring into the cavity. A ladle of a size suitable to complete pouring in a single filling is preferable since any changes in temperature can result in cold shuts, laminations or folds.

In case the size of the bearing makes a single ladle impractical, two are filled and pouring is substantially continuous. Details during this operation are important; ladles are preheated; metal in the pot is stirred prior to tapping; ladles are filled on a scale so that the required amount is accurately weighed.



Showing the range of bearing sizes that can be handled by the machine on opposite page. In addition to the bearing boxes shown, the machine can also handle precision type bearings.

Almost immediately after the metal is poured, the quenching water sprays are applied to the outside of the spinning bearing. It is desirable that cooling be uni-directional and from the outside inward. In this way, the hotter metal feeds to the outside to compensate for shrinkage and eliminate the possibility of shrinkage cavities near the bonding layer. Surface shrinkage due to solidification then appears on the inner diameter where it is usually removed during machining. Rates of cooling will vary with the alloys used; for example, lead base babbitts will require drastic chilling to avoid segregation, while the tin base alloys may develop trouble in the bond area under the same treatment.

Spinning is continued until solidification is complete. The bearing is then allowed to cool naturally. Upon removal from the face plate, the bearing is ready for the final step before machining. During the process of heating, tinning, mounting, etc., there may be some distortion of the bearing. It is necessary that the outside diameter of shells be checked for concentricity and other reference surfaces checked in the case of bearing boxes before the bore can be accurately machined.

To relieve stresses and restore the bearing to its normal shape, a proprietary method is used. Final machining to exact tolerances is the last step in the process.

Considerable success has been encountered with these re-babbitted bearings. The centrifugal casting and final working has apparently improved the fatigue resistance compared with that obtained by the more conventional static casting. The versatility of the spinning machine has made possible the application of this principle to a variety of bearings, including the highly successful re-babbitting of crosshead pin bushings.

Field experiences with these centrifugally cast bearings have enabled the firm to extend a guarantee of one year's satisfactory performance. This guarantee covers all failures attributable to the bearing itself excluding only those failures resulting from improper operating conditions or faulty installation.

For Winter Operation—

A Cold Starting Aid

*by J. A. Jones, Jr.**

COLD STARTING of modern high-speed diesel engines has been a serious problem for many years. The reason being that at temperatures below 32 deg. F., the temperature at the end of compression is below the ignition temperature of the regular diesel fuel and therefore fails to initiate burning—even though the fuel air mixture is combustible.

Various devices such as glow plugs, manifold heaters, headbolt heaters, air heaters and other types of heating mechanisms, have been used in attempts to overcome this problem. These devices have been successful only to a limited degree.

Both the petroleum and diesel engine industry have long been cognizant of the fact that the best cold starting results had been obtained from the use of specially compounded auxiliary fuels. Because these auxiliary fuels were frequently not available, and their usage costly as well as hazardous, the problem was only recently solved.

During the construction of the Alcan Highway, which began early in World War II, the U.S. Army faced the task of starting internal combustion engines in the dead of Alaskan winters—with temperatures ranging from 30 to 79 deg. below zero. At the Army's request, our research people spent considerable time in Alaska with the resultant development of Chevron Starting Fluid. This product is a specially compounded auxiliary fuel designed to facilitate the starting of internal combustion engines when, for reasons of temperature, humidity, altitude, or engine design, starting becomes a problem.

With the end of the war, it was decided to make Chevron Starting Fluid available as a service item to the many thousands of users of diesel and heavy-duty gasoline engines. It was well known by this time that in the colder sections of the United States the starting of engines—especially in such heavy-duty equipment as tractors, cranes, shovels, draglines, etc.—was costing operators many thousands of dollars every winter.

Inserting capsule into primer assembly. Plunger is screwed into bottom half of assembly and capsule is punctured by pressing down on the knob shown in driver's left hand.

Early Methods of Application

The first method used was a wartime expedient—a hand-priming injection pump, better known as a spray gun. This method involved squirting the fluid into the intake manifold system, either through the air cleaner or through nozzles installed in the fuel intake manifold. At least two operators were ordinarily required, one to do the priming and another to operate the engine's starting mechanism. Another drawback was the fact that there was no control over the amount of starting fluid injected into the engine.

The next method developed was the auxiliary tank system in which a supply of starting fluid was kept. This tank, mounted either within or without the operator's compartment, was permanently connected to the primer pump which forced the fluid to the injection nozzles in the intake manifold.

Many of these units are still in use today. This method requires the operator to purchase his starting fluid in metal containers with resultant storage, handling and evaporation loss problems. A further disadvantage is the fact that the auxiliary tank method allows the incorrect use of starting fluid as a fuel to prime the engine under load for more speed and power. Large bills have been paid for parts and repairs because operators couldn't resist stroking the primer to give the engine extra "lift" when it was already under stress.

Present Method

In 1948 a way was found to remove, to a maximum degree, the hazards and drawbacks of applying Chevron Starting Fluid by the methods described above. This was the capsulation method of packaging and dispensing the fluid to make its handling safe, its use easy and inexpensive, and the system simple to install.

This method provides for two sizes of gelatin capsules containing 7 and 17 cc. of starting fluid respectively. The capsule sizes have been designed to provide the correct quantity of fluid which experience has shown is required to start most engines.

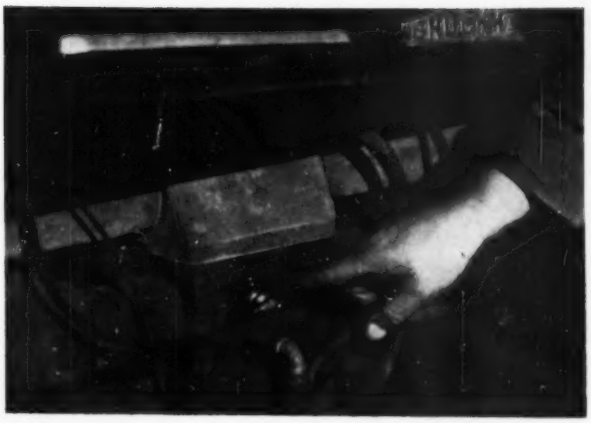
The capsules are used with a special puncturing tool and priming system permanently connected to the in-

*Manager, Sales-Special Products
The California Oil Company

take manifold system of the engine. One or more capsules are placed in the puncturing tool where they are punctured by the simple act of pressing down a plunger. The fluid, in a predetermined amount, is then released to the primer pump for priming into the engine by the operator. The priming system has been designed with one to three injection nozzles so that it is adaptable to all internal combustion engine types and sizes.

The capsule method has many advantages. The correct quantity to be used is predetermined and measured. There is little chance of over-priming or flooding the engine with excessive amounts of starting fluid which might cause damage to engine parts. There is no spillage, pouring, evaporation loss or waste. The capsules themselves are packed in metal containers for safe storage and easy handling and present no insurance problem.

The U. S. Bureau of Explosives has stated that the fluid in capsules and packed in metal cans may be shipped through all normal channels of transportation without the necessity for affixing the familiar diamond-shaped "red-label" to the shipping cartons. Each capsule is recognized as a satisfactory container, and when these are packed in metal cans the possibility of fire or explosion is reduced to a minimum. Cans of fluid in capsules may also be carried in the glove or tool compartments of commercial vehicles without violating ICC regulations or voiding insurance provisions.



Showing elbow nozzle assembly where fluid enters the intake manifold.

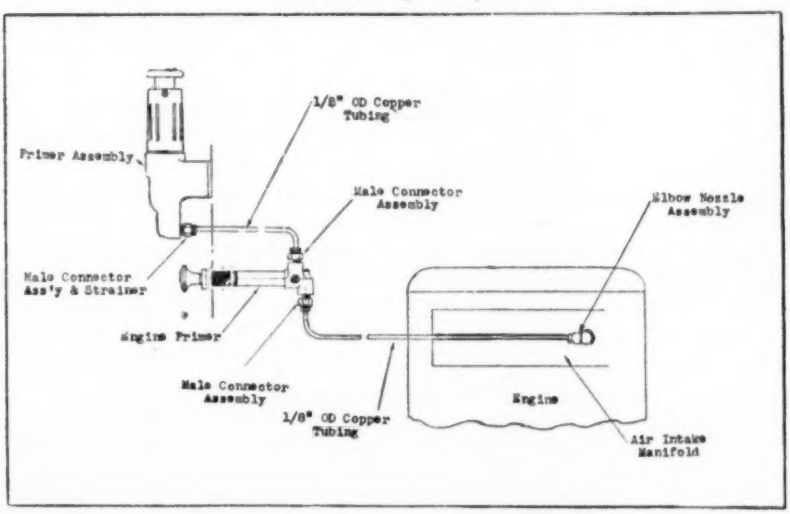
Properties

1. Low Ignition Temperature—about 370 deg. F. Suitable fluid-air mixture starts to burn at substantially lower temperatures than gasoline (about 1000 deg. F.), or diesel fuel (about 600 deg. F.).
2. Wide Inflammability Range — 2/48 per cent. Any mixture of this fluid and air in proportions from as lean as about 2 per cent fluid and 98 per cent air to as rich as 48 per cent fluid and 52 per cent air by weight is combustible; such range being much wider than for gasoline or diesel fuel (about 6/12 per cent).
3. High Volatility — indicated chiefly by relatively high vapor pressure (about 16.3 psi. absolute at 100 deg. F.). Fluid vaporizes at low temperatures more rapidly and completely than gasoline or diesel fuel, for which corresponding pressures are about 8 and less than 1, respectively.
4. Auxiliary Lubrication — minimizes wear of combustion chamber bearing surfaces from abrasion, scuffing and corrosion. Minimizes friction and, therefore, cranking torque. Minimizes blow-by and maximizes compression.
5. Corrosion Inhibition — this further minimizes wear of combustion chamber bearing surfaces from corrosion by water, carbonic acid, sulfurous and/or sulfuric acid, which result from combustion and condense on these surfaces at low temperatures.
6. Low Freezing Point — about —70 deg. F. This is well below any temperature likely to be encountered in service.

In addition to the important considerations of convenience and reduced expense, the use of the fluid insures against depletion of battery or compressed air as well as dilution of lubricating oil by the fuel. The starting period for the typical diesel engine at 30 deg. F is about 10 seconds.

The advantages of Chevron Starting Fluid have gained rapid and widespread recognition. Today the manufacturers of more than 90 per cent of high-speed diesel engines — or of equipment powered by these engines— have approved Chevron Starting Fluid and the capsule method of application. A large number of these manufacturers are installing capsule application priming systems in factory production, and many have these systems for sale to their dealers and customers as service items.

Sketch of starting fluid system.



Reviewing the Principles of
Centrifugal Purification

*by Kenneth D. Reed**

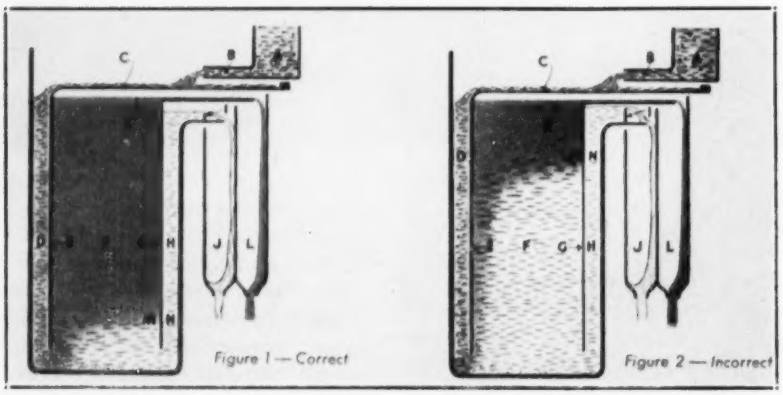


Figure 1 — Correct

Figure 2 — Incorrect

SINCE man began to operate machinery he has tried various means to reclaim lubricants or to extend their use, one of these methods being to utilize centrifugal force. Appreciation of the potentialities of centrifugal force led to the development in 1878, by a young Swedish engineer named Gustaf De Laval, of the first machine to separate immiscible liquids of different specific gravities and also to remove sediment and foreign matter from them.

Centrifugal force, scientifically applied in the centrifugal oil purifier as we know it today makes it possible to reclaim industrial petroleum products quickly and, in many cases, so economically, that the savings in oils that would otherwise be discarded soon amortize the investment in the centrifuge.

This is because of the effectiveness of a force many thousand times the force of gravity that is generated in the bowl of a modern centrifuge. This force quickly removes water, sludges and foreign matter that contaminate petroleum products, thus changing them in many cases from materials that are nearly useless because of the contaminants, to products that can be used over and over again.

Experimentation with various bowl configurations led Dr. De Laval to develop the present day bowl which has a larger diameter and operates at considerably lower speeds than the tubular type bowl. Furthermore, the addition of discs in the bowl, thereby dividing the stream of liquid into many thin layers, was felt to produce more efficient separation and increased the effectiveness of centrifugal force to a point where it was equal to approximately 10 times the actual centrifugal force developed by the revolving bowl.

The present day centrifuge bowl is known as the "balanced column" type bowl and the accompanying illustrations graphically portray the principle.

A "balanced column" type tank is shown in Fig. 1. However, before the condition shown was achieved, water was poured through inlet "A" until the main tank was completely filled and water poured out through spout "J". This initial step is necessary when separating a heavy liquid and solids from a light liquid and is known as "priming" or "sealing" the tank. It will be noted that there is a low baffle labeled "I" near the entrance to spout "J". Note should be made of the height of this baffle as it will be referred to later on.

After the tank has been filled with water, oil is poured through "A" into the tank. The small black lines in the illustration represent dirt or foreign matter that is to be removed along with the water. Eventually, because oil is lighter than water, it fills the main part of the tank as shown in the illustration and oil eventually flows out through spout "L" after having reached level "K".

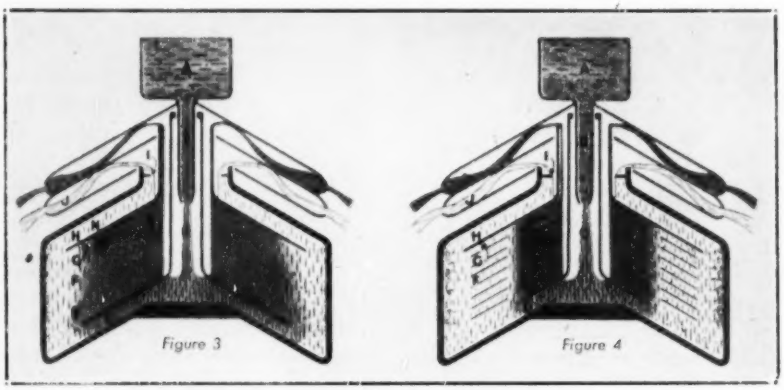


Figure 3

Figure 4

The amount of water in the tank has decreased considerably and a "balanced column" type tank results. It will be noted that the column of oil has a height "M-K" and the equivalent water column has a height "N-I" The oil column is longer than the water column, the difference being due to their difference is specific gravity. Column "M-K" is related to column "N-I" inversely as the specific gravity of the oil to that of water.

*Industrial Division, De Laval Separator Co.

If the contaminated oil was fed into the tank at a rate slow enough to allow gravity to take effect, the sediment would collect at the bottom of the tank and water would continue to flow out through spout "J". The clean oil would pass out through spout "L" as long as oil was fed to the tank. If the inflow was shut off completely and the flow from the spouts also stopped, the addition of a drop of oil to the tank would cause a drop of oil discharge from spout "L". By the same token, a drop of water fed to the tank would displace a drop of water from spout "J" and equilibrium is restored.

Fig. 2 shows a similar tank but there is a radical change in baffle "I". Careful examination of the picture will show a difference between "M-K" and "N-I" but, as it can plainly be seen, the difference is much less. A tank with a baffle of the height shown in this second picture would not be very efficient if the flow rates were the same as in the first instance as there would not be enough time for gravity to take effect and wet, or dirty oil might discharge through spout "L" even though there was some discharge of water through spout "J" and some settling of dirt to the bottom of the tank.

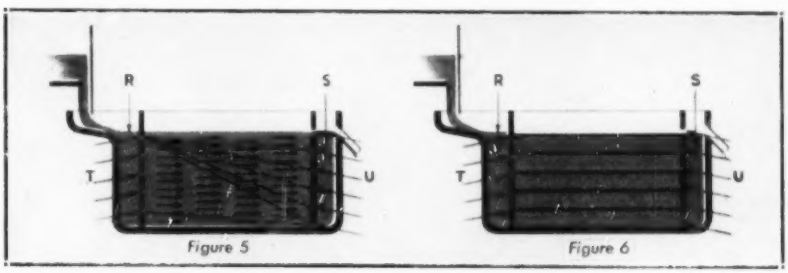


Figure 5 Figure 6

Development of a centrifugal bowl is shown in Fig. 3, this being done by taking two "balanced column" tanks, distorting them to the shape shown, the final result representing a cross section through a bowl. A careful examination of this picture will show columns "M-K" and "N-I" with the former being the longer of the two, as before. The baffle "I" is now shown as the cross section through a ring inserted in the neck of the bowl and this is known as a discharge ring.

Oils of different specific gravities can be handled in one machine by changing the discharge ring, light oils generally requiring a large discharge ring and heavy oils requiring a small discharge ring. Since the neck of the bowl is a fixed diameter, the change in the size of the discharge ring is in the inside diameter. It is, obviously, simpler to change the diameter of the discharge ring than to change the diameter of the bowl. Furthermore, since the specific gravity of water does not vary as rapidly with changes in temperature as does that of oil, the changes in the bowl for different oils are actually changes to maintain the proper length of the oil column to compensate for differences in specific gravity.

It will be noted in this picture that the bowl is of the "balanced column" type and it will be further noted that the body is quite thick. Fig. 4 illustrates two things, one being the thin layer principle accomplished by adding discs to the bowl and the second being a condition equivalent to that shown in Fig. 2 where the height of baffle "I" was increased considerably over that shown in Fig. 1. In this case, the opening on the discharge ring is much smaller than in the previous picture and, as a result, less than half of the bowl is being utilized by the oil and centrifugal force is reduced proportionately.

Here the effective diameter is reduced and the velocity through the bowl, with a given rate of flow, has been increased, so the bowl would operate less efficiently although its efficiency would remain constant until outer diameter of the oil column. This such time as the dirt accumulated in the bowl to a point adjacent to the illustrates the way in which a bowl should not be operated.

Figs. 5 and 6 illustrate the effect of adding discs to a bowl, the first illustration showing the flow across a tank that is not fitted with shallow trays. The small dots at the end of the broken lines represent particles of dirt and it will be noted that some settle to the bottom of the tank before going all the way across and others are still in suspension as they are passing through the perforated baffle at the extreme right end of the tank.

The addition of shallow trays as shown in the next illustration would mean that all of the particles would be caught in the trays before they reach the other side of the tank. Hence the oil that discharges from the tank would be free of foreign matter, providing the right flow conditions were used to permit gravity to do its work.

A sectional view typifying bowl construction is shown in Fig. 7. It is

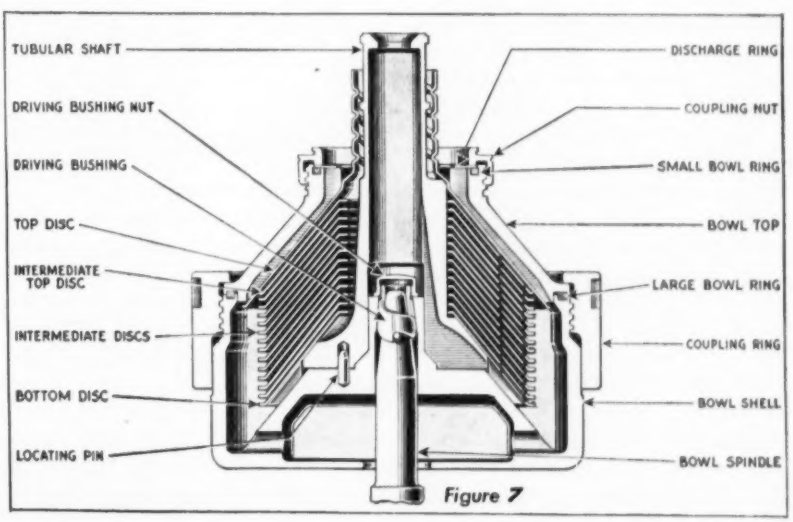


Figure 7

interesting to note that the centrifugal force developed in bowls of the construction shown ranges from 5000 to 6000 times gravity, the centrifugal force varying with the location of the "neutral zone" or line of demarcation between the oil and water in the bowl. The use of the discs in the bowl increases the effectiveness of centrifugal force to a point where the resultant of the forces, as proven mathematically, is equivalent to 50,000 to 60,000 times gravity. Most products are handled in bowls having discs spaced 0.050 in. apart, and more discs are used than shown.

Mention was made of the use of different discharge rings for different specific gravities. Selection of the proper ring can be based on a chart provided by the manufacturer. Due to changes in temperature and other factors it may be necessary to choose a ring either smaller or larger but the chart offers a starting point. In general it is desirable to use the largest ring possible without loss of oil with the water.

Whether it be turbine oil in a power plant, fuel or lubricating oil for diesel engines, cutting oils for automatic lathes, etc., centrifugal force will speed up the process of reclamation.

Due to space limitations, we cannot dwell on each application in detail. However, the purification of diesel fuel oil is quite well known as an important factor in efficient combustion of fuel oil in diesel engines. One of the more recent advancements in the reclamation of lubricants is the use of units combining centrifugal oil purifiers and pressure type filters for the purification of diesel engine lubricating oils. This combination of the use of centrifugal force and micronic filtration at temperatures of approximately 180 deg. F has made a marked difference in the performance of stationary and marine diesel engines wherever they have been installed.

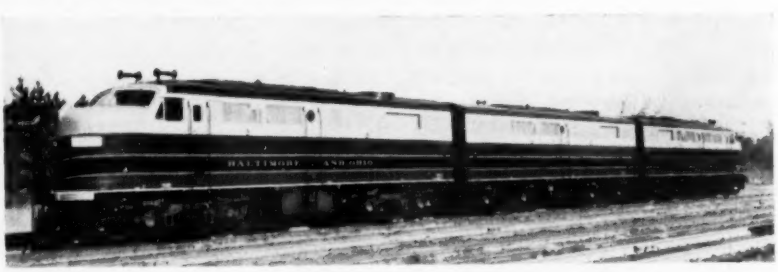
Alco-GE Locomotive Development

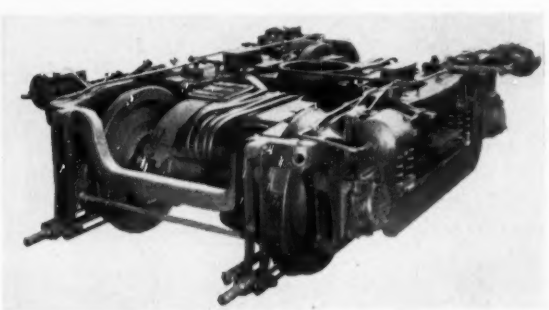
A NEW demonstrator locomotive will be operating on eastern railroads for the next several months, according to an announcement by American Locomotive and General Electric.

The new Alco-GE 6400-hp. diesel-electric is described as a dual-purpose locomotive, designed for freight operation, but applicable to passenger service with the installation of train heating equipment. Its continuous pulling force is nearly 25 per cent greater than previous models, resulting from major driving motor improvements and increased weight.

Composed of four 1600-hp. units, the 6400-hp. diesel-electric is one of the most powerful and versatile locomotives on the rails today. It has a normal top speed of 65 mph. However, with a simple change in gearing, a maximum speed of nearly 100 mph. can be obtained for fast passenger service.

The diesel engine in the new demonstrator is turbosupercharged, maintaining maximum horsepower output even up to altitudes of 10,000 ft. This maximum flow of power makes it possible for the new locomotive to haul heavier trains over steep grades. Increased tonnage also can be handled on long downgrades because of the locomotive's tremendous braking force of 8000 bhp. at the rails, produced by reversing its powerful driving motors. This dynamic braking feature, the effect of which might be compared to putting an automobile into low gear, enables the demonstrator to bring heavier trains down the steepest grades with complete safety.





A 4800-hp. 3-unit freight unit for the Baltimore and Ohio. Units have steam generators for dual purpose usage. Right, one of two 4-wheel, pedestal type, swing motion trucks used per unit.

A similar demonstrator locomotive is operating over western railroads, equipped with train-heating equipment. Enough heat can be produced by its four steam generators to heat 100 average-sized homes, answering railroad requirements for heating long passenger trains operating in sub-zero temperatures. Both demonstrators have been winterized through many advanced techniques, enabling railroads to offer improved on-time performance despite adverse weather conditions.

The new dual-purpose design is the successor to the Alco-GE freight locomotive model, of which more than a million horsepower have been delivered to American and foreign railroads since 1945. To produce the new design locomotive, 24 major improvements, all of them thoroughly field-tested, have been incorporated in the demonstrators, the builders report. Maximum interchangeability of parts between the new design and the older freight locomotive has been retained.

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PLENTY!

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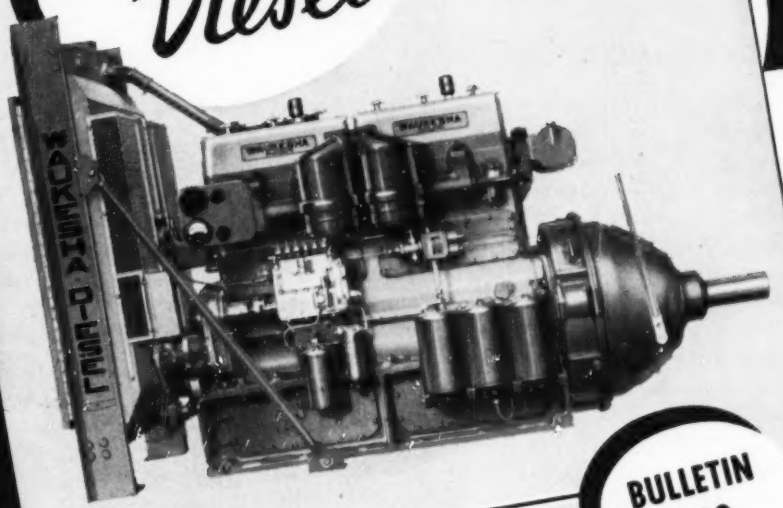
WAUKESHA

MOGUL SIX POWER UNIT

6-NKDU Diesel



BULLETIN 1569

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS.

Eastern Sales Office: Eight W. 40th St., New York 18, N. Y.
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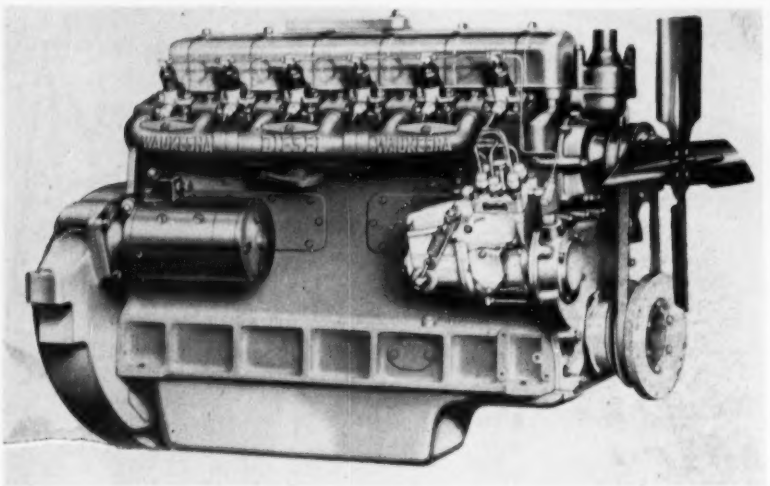
Pacific Coast Office: 4927 Pacific Blvd., Los Angeles 58, Calif.

WAUKESHA
MOTOR COMPANY
WAUKESHA, WISCONSIN
NEW YORK TULSA LOS ANGELES

● High continuous net output—201 hp continuously at 1050 rpm—that's with all standard power unit accessories. And momentary overload is 272 hp at 1200 rpm. Waukesha's new Mogul Six is a full Diesel, four-cycle, solid injection. Six cylinders, 7-in. bore, 8¼-in. stroke, 1905 cu. in. displacement. Its unique patented combustion chamber cannot be had in any other American Diesel engine! That means smooth, clean, shock-free operation with high fuel economy. You can change over to natural gas, or vice versa, right in the field (there's a quick conversion kit for this). This Diesel unit has all "top drawer" mechanical features—lots of 'em—all interesting. New Bulletin 1569 tells you. Send for one.

110

New Products



Waukesha Diesel Line Expanded

The latest addition to its line of diesels, a 135 hp. 4¼ x 5, 6-cylinder engine, has been announced by the Waukesha Motor Company. The engine had its first public showing at the New York Transport Vehicle Show early this month.

The overhead valve engine has an alloy cast crankcase with heavy outside ribs at the base to insure maximum stiffness and maintain alignment of all moving parts. Internally, the seven bearing bridges tie into the side walls with large-radius fillets, and the thick upper and lower decks make the structure distortion-free, and provide solid support for the renewable dry type cylinder sleeves.

The engine retains the typical Waukesha spherical combustion chamber and has Stellite faced valves and seats. Aluminum four-ring pistons, drop forged crankshaft with hardened journals and crankpins, copper-lead bearings and full pressure lube system are some of the other features of the engines. Additional components include American Bosch fuel system; front-mounted, belt-driven coolant pump with built-in bypass and thermostat and large coolant jacket water clean-out plates on the side of the block.

Interesting Gear Pump Design

Design of a modified gear pump developed by M. C. Caughrean, San Francisco, Calif., promises a number of advantages over conventional designs. "Gear pump" under the terms of the patent granted is used in its broadest sense and includes the "Roots Type" unit in which a pair of intermeshing impellers are used.

Objectives of the design were to increase general efficiency, reduce vibration and knock incident to the trapping of the fluid when the gears meshed and to permit quick, accurate adaption of the pump to fluids of different viscosities and at different pumping rates.

The principal variance from conventional design is the incorporation of adjustable relief channels of semi-circular section in each side of the pump casing at right angles to a line connecting the gear shafts and centered opposite the ends of the common pitch line of the meshing gear teeth. A sliding seal block is fitted in each channel.

The channel functions as a relief for the pressurized fluid trapped by the meshing of the gears and the actual point where relief ceases can be adjusted by movement of the seal blocks. By minimizing these pressures, vibration and knock are lessened and shaft deflections as well as bearing loads reduced. Due to the positive relief at the ends it is possible to fit the gears with considerably less clearance than in conventional models with a resultant increase in efficiency.

Conventional gear pumps are sometimes provided with fixed grooves but their location is a compromise since, due to variations in kinetics, inertias, and viscosities of different fluids, the optimum point of relief varies. This point is critical and for best results should be adjustable as in the case of the new pump.

Another feature of the adjustable seal block is that it can be so positioned as to provide a full range from non-pumping to full delivery. Where variable volumes at constant pump speeds are desired, it is possible to arrange for the necessary seal block movement automatically by spring, hydraulic air or electric control.

Electrical Equipment Tester

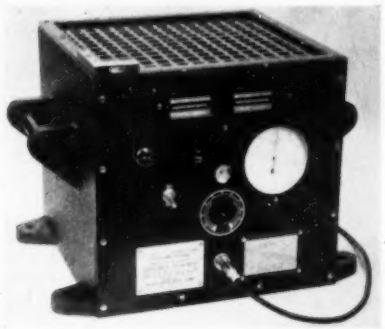
An instrument designed to test electric voltage regulators on automotive vehicles has been announced by the Crumbliss Mfg. Co. The firm says that use of the instrument will enable the maintenance or repair man to check the electrical equipment on a vehicle in a fraction of the time needed using ordinary methods.

The unit consists of a cabinet with an instrument box mounted on top. The instrument box contains a voltmeter, ammeter, voltage control dial, motor speed control dial, current control lever and other instruments necessary for the checking of this equipment. In use, the rig is plugged into any 110 volt outlet and the regulator is hooked up according to simple instructions. The tester duplicates the action of the various electrical components of the system and the meters indicate whether or not the regulator is properly adjusted.

Torque Dynamometer

Avion Instrument Corp. announces the development of a new type of dynamometer for measuring torque developed by prime movers rated from ½ to 10 hp. Compactness, portability and large power ratio result from the use of magnetic particle coupling.

The Magnetorque dynamometer dissipates 4 hp. continuously at 3600 rpm. It will measure torque equivalent



to 10 hp. at 4800 rpm. if the duty cycle maintains the operating temperature below 220 deg. C. Additional loading may be handled if external cooling is provided.

The device may be used at any speed from 0 to 6000 rpm. and is calibrated in the range from 1500 to 6000 rpm. The moment of inertia of the rotating member is 0.132 lb-ft-sec^2; static friction is 0.35 lb-ft; dynamic friction is 0.13 lb-ft. Total loading due to windage and internal friction is about 0.6 lb-ft. and is relatively constant at speeds from 1800 to 6000 rpm. Accuracy is 5 per cent of full load.

Induction Motor Development

Fairbanks, Morse & Co. have recently extended their line of type QZE, totally enclosed, non-ventilated, squirrel cage, induction motors to include continuous duty ratings built in NEMA standard frame 284. At present, 7½ hp., 1800 rpm. and 5 hp., 1200 rpm. motors are in production.

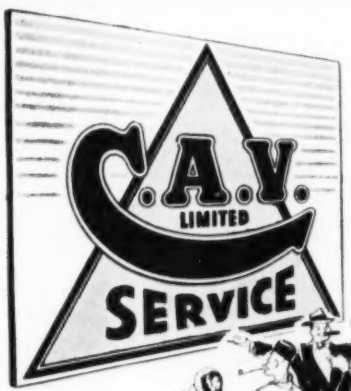
These motors conform in all respects to NEMA and ASA Standards for totally enclosed, fan-cooled motors of the same ratings. They are suited for service in adverse locations where dirt, dust, lint, metal turnings and sand are prevalent, since there are no ventilating openings to clog.

Custom-Built Switchboards

A new line of custom-built, pre-engineered switchboards has been announced by the Trumbull Electric Mfg. Company. The line is described as a new type switchboard which is designed to centralize power and lighting switching in one dead-front, free-standing package.

It consists of a series of vertical rigid steel troughs into which are inserted all types of switching devices. All troughs are connected by continuous power bus which may be fed from the bottom or top of the trough. Individual switchboard units take power from silver-plated, vertical bus bars by means of spring-loaded stabs which are attached to back of units. Each unit is mechanically and electrically isolated from other units in case of faults or short circuits.

The standard 18-inch trough mounts circuit breakers up to 600 amps. and fusible switches up to 200 amps., 600 volt maximum. Two larger size standard sections of 22- and 28-in. widths

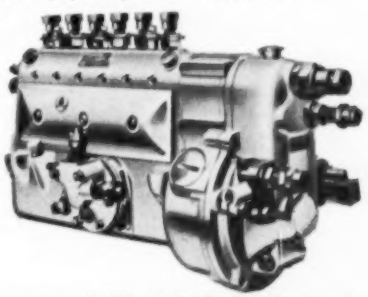


Confidence Abroad

Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney — there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



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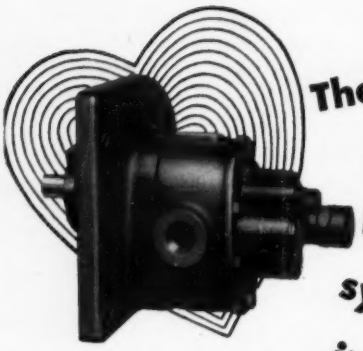

The HEART of a diesel lubricating system is its PUMP

Rotary geared pump with special flange mounting becomes integral part of diesel engine when installed. Note opening above relief valve for tachometer.

Modern diesel operation generally requires a pressure lubricating system — and the vital element is the pump. Thousands of Brown & Sharpe pumps are now providing reliable service month after month without interruption, for lubrication, transfer, or booster systems. Available with various types of flange mountings and special internal construction to meet specific requirements. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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MODEL YRF

ENGINE PRESSURE INDICATOR

for DIRECT-READING of COMPRESSION AND FIRING PRESSURES OF EVERY TYPE OF DIESEL ENGINE

ONE OF THE FEATURES Responsible for Its Overwhelming Preference by Leading Diesel Manufacturers and Operators

Successive readings may be taken rapidly since no venting of the instrument is required between readings. No closing of valves required to change from firing pressure to compression pressure reading.

For other features, write for Bulletin 294

ACCURATE PRESSURE READINGS as high as 1700 P.S.I.

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INDUSTRIAL INSTRUMENT CO.

7000 BENNETT STREET • PITTSBURGH 6, PA.

are available for fusible devices up to a 1200 amp., maximum, and for circuit breakers up to 1600 amp., maximum. All troughs are 90 inches high and line up in appearance and mechanically with large, rigid-type switchboards.

Because it is pre-engineered and pre-fabricated with all parts standardized, it is said to be economical from both the construction and installation standpoints.

Quick Change Gear Mechanism

A quick change gear mechanism for lathes of 14½ and 16 in. swing is announced by the South Bend Lathe Works. The firm says the new equipment is designed to save time and to give long dependable service.

A small number of parts and the inclusion of ball and needle bearings in the mechanism makes for a more sturdy item which can operate on less power than comparable models. A direct reading index chart shows positions in which the two conveniently located tumbler levers are placed for each of 48 screw thread pitches, 48 power longitudinal feeds, and 48 power cross feeds. There are no sliding clutches or sliding primary end gears to change. Shifting a single lever changes feed instantly from coarse to fine, for roughing or finishing cuts.

Power Units

Development of two special power units, specifically designed for use with Nelson stud welding equipment, is announced by the Morton Gregory Corp. One unit is a motor-operated generator set capable of welding studs up to and including ⅝ in. in diameter. The other is a specially designed battery-operated unit which can be used for installing studs up to ½ in. diameter with the Nelson automatic stud welding gun.

In stud welding performance, the power unit is equivalent to two conventional 400-ampere generators in parallel, although its cost is approximately one-third less than the two units. The compact unit is comparable in size to a 200-amp. welding generator and weighs approximately 800 pounds. Either 220-volt or 440-volt, 60-cycle alternating current can be used with the new power unit.

The stud welding battery unit, requiring only a 110-volt outlet for its operation, is particularly useful for construction jobs where welding generators or necessary power are not available, and for plant maintenance operations.

Motor Starter

Protection of operating personnel as well as the connected machine is stressed in a new motor starter—the Motor Watchman, Class 10-100-S1—available from Westinghouse Electric Corporation.

With ratings up to 600-v, 7½ hp. polyphase, 5 hp. single phase; or 220-v, 1½ hp. dc., it starts, stops, and provides overload protection for single phase, polyphase and dc. motors.

The self-indicating handle, interlocked cover that prevents opening unless starter is "off", and safety latch to lock starter "off" during servicing are personnel-protection features.

Positive motor-protection is provided by the quick-make, quick-break.

over-center toggle mechanism—De-ion arc-quenching—and the bimetallic disc-type thermal overload relay.

Straight-through wiring is designed to facilitate installation and servicing, and Bonderized enclosures prevent blistering, flaking and corroding.

New Paint

A new type of paint which changes color automatically at increasing degrees of temperature is aiding the Socony-Vacuum Oil Company, Inc., in studies of cooling processes for air-cooled internal combustion engines.

It is being used by the Technical Service Department, Socony-Vacuum Laboratories, Greenpoint Avenue, Brooklyn, N. Y., where technicians said color bars created by different temperatures on a painted engine are fundamentally similar to the isobars of a weather map.

The paint is formulated to provide 15 basic shades for original application. It assists, according to the Socony-Vacuum technicians, in determining proper locations for thermocouples to measure internal heat while an engine is in operation.

Without prior application of one of the basic shades of paint, placing of thermocouples may distort air currents around the test engine sufficiently to affect the accuracy of the measurements.

Circuit Breakers

Allis-Chalmers Manufacturing Company has announced that its Types G-25 and G-50 low voltage air circuit breakers, previously available only as bare breakers or in metal-enclosed switchgear, can now be had for individual mounting.

The individual, stationary mounted breaker has a sheet steel enclosure formed and welded into a housing that completely encloses the circuit breaker and cable connections. The front portion of the enclosure is provided with an easily removable hinged panel, ventilating louvers, latching mechanism and door handle, hasp for locking and necessary flash barriers.

The rear portion or cable entrance box can be separated from the breaker housing and includes removable cover plates at the top, bottom and sides for easy connection, and cover plates with 3-, 3⅝-, 4⅛-, and 4⅝-inch diameter knockouts for incoming and outgoing cables. Weather proof units are completely rubber gasketed and lifting lugs are provided for ready and easy handling.

Murphy Diesel Line

A new line of heavy duty diesel engines has been introduced by the Murphy Diesel Co. The new line consists of six models from 145 to 220 hp. designed to operate at 1400 rpm. It is expected that the higher speed will cause the engines to find many applications, including those requiring torque converter power transmission. The engines are the basic Murphy Diesel design. All models feature unit injection, four valves per cylinder and a hydraulic governor.

Flush Case Gage

Helicoid Gage Division, American Chain & Cable Company, Inc., an-

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A. C. and D. C.

GENERATORS

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Columbia, with its years of experience, brings to generator set assemblers a wide line of performance proved, sturdily built, A. C. and D. C. Generators.

AC Generators: 6¼ to 1000 KVA
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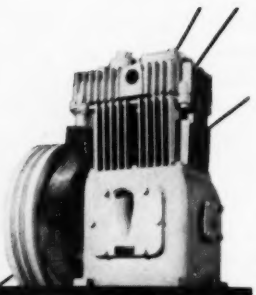
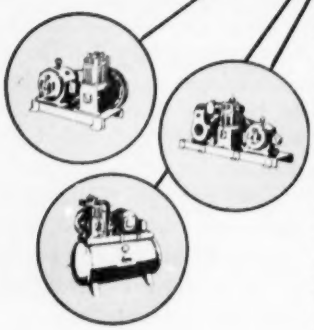
MODERN COMPACT

Quincy COMPRESSORS



For Dependable COMPRESSED AIR SUPPLY



Quincy Compressors are not only compact, but they are always dependable. Specially designed for greater durability, Quincy Compressors features include—Timken Bearings—Lynite rods—perfectly balanced crankshaft—copperfinned intercooler—automatic and positive lubrication. Quincy Compressors are available in a wide variety of sizes ranging from 1 to 90 c. f. m. Depend on a Quincy specialist to help you select the correct type and size compressor to meet your requirements. Write Dept. J-16 today for details and latest prices.

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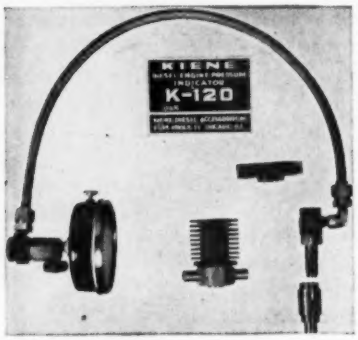
KIENE MODEL K-120 UNIVERSAL PEAK PRESSURE INDICATOR



Model K-120 with cooler body and nozzle dummy.

MODEL K-120 Indicator has but one moving-part—nothing to wear or get out of adjustment.

VALVE—Gas trap type with diaphragm type check valve having adjustable lift. Stainless steel valve and seat.

No springs—No pistons—no complicated adjustments — No temperature corrections — no pressure loss in check valve.

GAGE READS TRUE PRESSURE—MAY BE RECALIBRATED ON ANY GAGE TESTER

Check readings can be made over and over again by releasing indicated pressures with bleeder valve.

GAGE—Hydraulic 3½ inch dead weight tested in suitable range to specification requirements.

ADAPTORS available for most models of engines manufactured in U.S.A. Other models made to order at reasonable prices.

For

Testing Firing and Compression Pressures on all Models of Diesel and Gas Engines.

Dependable — Easy to Use — Rugged. May be Used With or Without Flexible Tube.

DESCRIPTIVE BULLETINS AND PRICES FURNISHED ON REQUEST

Manufactured under patents No. 2280411, No. 2325325, others pending

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

nounces a new gage case for flush mounting gages on panels. This new square case has the same bolt circle and the same round cut-out in the panel as standard round flush cases of the same dial size. The width of the square front flange is considerably less than the diameter of the conventional round front flange. The new square case takes up less room and is particularly suitable for panel installations to match other square case instruments.

Electric Fuel Pump

The Bendix Aviation Corporation, through its Eclipse Machine Division, announces the new Bendix Automotive Electric Fuel Pump. The result of five years of research and development, this new electric fuel pump is now in production for the military services supplying fuel to coolant heaters and space heaters, as well as supplying fuel to carburetors.

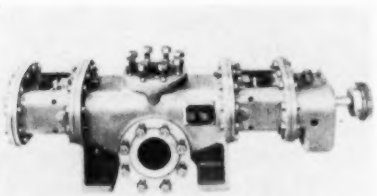
While the pump was designed principally for automotive use, its compact design and performance characteristics make it applicable to other fuel transfer requirements.

A single pump will deliver up to 30 gallons per hour. Static pressures up to 7.0 psi. are obtainable. For larger requirements two or more pumps are manifolded in series or parallel.

The pump is powered by a solenoid. Pumping is achieved by the movement of a hollow plunger controlled by an interrupter in the electrical circuit; neither a sylphon or rubber diaphragm are used. This permits a smooth, steady output of fuel at all temperatures.

Screw Pump

A new external gear and bearing bracket type screw pump for positive displacement of non-lubricating liquids of all viscosities at 1 to 700 gpm., is announced by the Sier-Bath Gear & Pump Co., Inc. According to the manufacturer, the new pump's single-point alignment, "dual-controlled" rotors, and other new features provide greater durability, easier installation, and faster servicing.



The external timing gears and all bearings are in housings, which form an integral unit with the pump body. Thus there can be no strain on bearings, or misalignment of shafts or rotors due to change of respective positions of pump body and separate housings. The timing gears and bearings move with the pump body, if there is a slight displacement of the pump elements during installation, or if the pump body expands when handling hot materials.

New Literature

Hose Folder

A four page folder describing several of the many applications for flexible metal hose and tubing has been released by the American Metal Hose Branch, American Brass Company. The folder contains illustrations of 13 different applications and gives a brief description of the products of the firm.

Lube Oil Pamphlet

A pamphlet "Lubricating Oil Recommendations for Slow and Medium Speed Diesel Engines" has just been published by the Sinclair Refining Company. The 8-page folder contains some background information on classification of diesel engines and diesel lubricating oil. It then goes into a description of Sinclair diesel oils and describes the uses for the various lube oils put out by the company. A chart is included which gives lubrication recommendations for slow and medium speed engines of practically every make and model.

Welding Booklet

A twenty-four page reference and instruction book, "Welding With Ampco Bronze Electrodes" has just been released for distribution. The contents include technical and pertinent information about every bronze electrode which Ampco Metal, Inc. manufactures along with recommended welding techniques, welding procedures, and machining suggestions.

Convenient charts covering the selection and preheating of bronze electrodes and the weldability of Ampco electrodes are also included.

POWER FOR A POTASH EMPIRE!

Big Savings at Bonneville Flats

Lister-Blackstone 20 H.P. model 18.2 of the type used at Bonneville.

On Utah's famed, far-flung Bonneville Salt Flats, remote from power sources, eight Lister-Blackstone Diesels replace, out-perform, outwear and out-economize gasoline engines formerly used by Bonneville, Ltd. in giant potash-producing operations. *They are slashing fuel costs by enough to pay for themselves in well under a year!*

Produced for ECONOMY-PLUS-RUGGEDNESS, these movable Lister-Blackstones run unattended 24 hours a day in summer heat, at 4000 ft. altitude, distributing salt brine amongst huge potash-producing evaporating lakes.

Lister-Blackstone

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Pick a Lister-Blackstone for LONG-LIFE ECONOMY, LOWEST PRICE, BIGGEST DOLLAR VALUE, ASSURED DELIVERY. 3 to 480 H.P. ORDER NOW.

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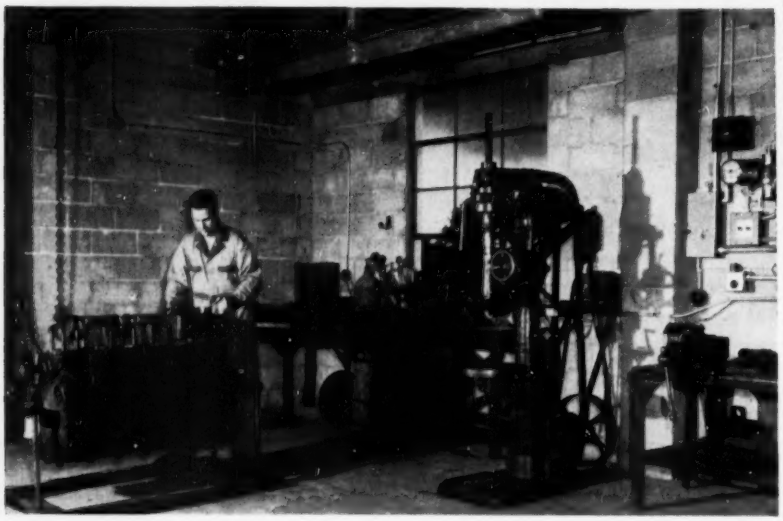

Cummins Service Expansion

Expanded facilities to serve trucking, industrial, and other users of diesel engines have been opened in Toledo, Ohio, by Cummins Diesel Service and Sales of Michigan. Inc. Headquarters for this dealership are 3601 Gratiot Ave., Detroit.

The new shop is located at 225 West Alexis Road, only three blocks west of the Dixie Highway on the Toledo by-pass. The building has 3,010 square feet of floor space, five truck bays, and equipment for complete engine overhaul and rebuilding. The engine rebuilding section is shown.

The equipment includes a fuel pump test stand and facilities for Cummins injector repair. The parts department is fully stocked with genuine Cummins-warranted parts, and road service is available 24 hours per day in the area of Northern Ohio and Southern Michigan from this new location.

Presidential Award to Wilkening

One of the very few concerns to be so honored, Wilkening Manufacturing Co. of Philadelphia, makers of Pedrick piston rings, has been presented with an Award of Merit by the President's Committee on "National Employ-the-Physically-Handicapped Week."

The citation reads: "Upon the recommendations of the citizens of Philadelphia and the approval of the Governor's Committee of Pennsylvania this Award of Merit is presented to Wilkening Manufacturing Co. for outstanding efforts in employing physically handicapped men and women for work suited to their abilities and because of an enlightened policy of recognizing that *abilities*, not disabilities, are important."

Two years ago, before National awards were instituted, Wilkening received a Pennsylvania State Award. In making the presentation of the Presidential Award, Mr. Fred R. Rollman, head of the West Philadelphia District, pointed out that Wilkening is the only concern in the district that met the criteria over a period of years, utilizing the handicapped in all categories, with no limitations on advancement. The Award had the complete approval of the labor union, the State authorities, and the U. S. Department of Labor.

In accepting the Award, Mr. F. W. Wilkening said in part: "In all of our history, it has been a fixed and basic policy of this organization to provide opportunities wherever possible for those who are in any way handicapped so that their remaining abilities may be put to productive use. Our experience has been that we have been able to maintain a high degree of efficiency, and at the same time promote a happier relationship among our people."

ESB International Corp.

Establishment of a new wholly owned company to carry on the foreign business of The Electric Storage Battery Company and its subsidiaries was announced by S. W. Rolph, president of the parent company.

Speaking as head of the newly organized firm, ESB International Corp., Rolph said, "Our over-all objectives are to serve our customers in the foreign field in the best possible way and develop and extend our participation in world markets. Since The Electric Storage Battery Company and subsidiaries have been operating in the export field for many years, we shall be doing business with old friends."

Incorporated under the laws of Delaware, with authorized capitalization of $3,000,000 ESB International's world-wide operations will be directed from new offices at 500 Fifth Avenue, New York City. The new corporation has taken over the export and foreign activities of The Willard Storage Battery Company and The Electric Storage Battery Company.

Cooper-Bessemer Nodular Iron Report

Many highly stressed engine and compressor parts, which heretofore have been produced from more costly cast steels or steel forgings, can now be successfully made from nodular iron, according to T. E. Eagan, chief metallurgist of The Cooper-Bessemer Corporation.

Since Cooper-Bessemer was the first company licensed to produce nodular iron for use in engine and compres-

sors, wide-spread interest has focused on Mr. Eagan's development work, not only from foundrymen and designers in this country, but from machinery builders and oil equipment operators throughout the world. While, according to Mr. Eagan, there is still considerable development work to be done in perfecting melting techniques and casting procedures for large scale production, basic data already gathered confirms initial promise that nodular iron is a better material than mild cast steel for many castings of intricate design.

Speaking before regional meetings of the American Foundrymen's Society (of which he is a director) in Los Angeles, San Francisco, Portland and Seattle, Mr. Eagan disclosed that nodular iron is now being produced possessing tensile strengths exceeding 90,000 psi. Ductility is averaging ten times that possible with cast iron. Fatigue tests conducted on high pressure cylinders are demonstrating that nodular iron equals and in many cases exceeds the fatigue endurance that can normally be carried with mild cast steel.

Truck Needs in 1951

The nation's trucking industry will require this year about 620,000 new medium and heavy trucks, truck tractors and trailers, James K. Knudson, Defense Transportation Administrator, was recently informed.

The requirements, the agency chief was told by John V. Lawrence, managing director of the American Trucking Association, is based on a detailed national survey, which did not include requirements for military and other government vehicles.

The new equipment needs, covering those for medium and heavy units to haul regular and defense production freight, were the first estimates for 1951 to be presented by the industry. Requirements for the tire equipment for light trucks, which make up the major part of the country's 8,300,000-truck fleet, are to be presented later. It was said that the defense transportation office is expected to translate the figures into requests on which mobilization control agencies will base production directives.

Reliance Electric Expands

Rapidly mounting demands for electric motors and controls from the military services, and industries now swinging into the national defense program, makes imperative a further expansion in manufacturing facilities by The Reliance Electric & Engineering Company, according to J. W. Corey, president.

The new plant, to cost in excess of $1,500,000, will be in the Cleveland area and involves construction of a one story building of 130,000 sq. ft., similar in important essentials to a plant of approximately the same size built by Reliance in Ashtabula four years ago.

Two smaller Reliance plants will be released just as soon as operations can be moved from them into the new plant.

Present Reliance plants on Ivanhoe Road in Cleveland will be retained as will the Ashtabula plant. Motor

Like a police dog

it watches and protects your engines

Oil pressure failure or overheated cooling water can happen anytime ... and it can happen to the best engine! But serious damage and costly repairs resulting from such minor troubles *can be prevented* with a PENN Safety Control.

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Simple to install on new or old engines, PENN Safety Controls are available in three basic models (1) oil pressure only (2) water temperature only (3) combination pressure and temperature. Learn more about this *low-cost protection*, send for Bulletin E-100. Write **Penn Electric Switch Co., Goshen, Indiana.** Export Division: 13 E. 40th St., New York 16, U. S. A. In Canada: Penn Controls, Ltd., Toronto, Ont.

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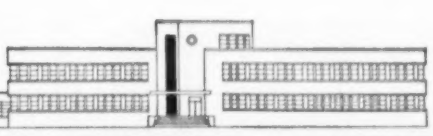

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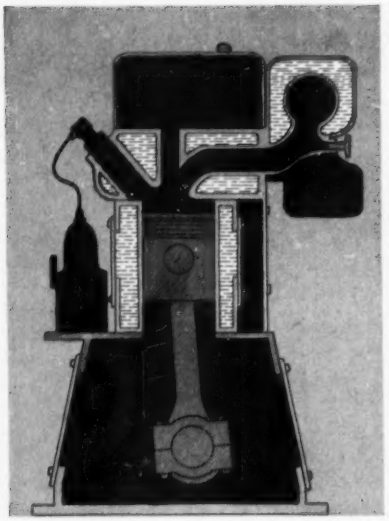

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production will be further increased at all of them particularly after the transfer of renewal parts manufacture to the new Euclid plant has been effected, Corey said.

"Renewal parts," Corey added, "are as essential to the defense program as is the manufacture of motors since they serve to keep existing motors in repair and functioning during a period when completely new equipment would be difficult to obtain."

Auto-Lite Expansion

Work is under way on a major addition to the LaCrosse, Wis., plant of The Electric Auto-Lite Company, Royce G. Martin, president and board chairman has announced.

The addition will add approximately 120,000 sq. ft. of manufacturing and will cost approximately $1,000,000. Completion is expected by the first of February. It will permit necessary expansion of production of instruments and gauges for automotive and industrial use.

Commenting on the continued high level of sales and earnings, Mr. Martin pointed to the increase of $2,622,-028 in sales during the first three quarters of 1950 compared with 1949 as reflecting the upward trend of the automotive industry and representing increases in all classifications of sales for Auto-Lite.

"With our enlarged facilities we have been able to maintain schedules and take on additional business as well," Mr. Martin said. "Any curtailment of this upward trend in the last quarter will only occur as basic raw materials become shorter in supply as a result of the expanding emergency program."

The company has for some time been negotiating on a number of projects in the defense program, Mr. Martin declared, in order to be in a position to meet the necessary demands and schedules as and when the company is called upon.

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Our thorough practical training in operating, maintaining and repairing of Diesel equipment gives these graduates sound fundamentals . . . couple this to their faith in Diesel's future, and you have the kind of men you want to grow with you.
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American Flexible Rep

Appointment of the H. H. Kumler Company, Houston and Tulsa, as representative in the states of Texas and Oklahoma, is announced by the American Flexible Coupling Company, manufacturers of American Flexible Couplings and Ameri-gear Couplings for power transmission.

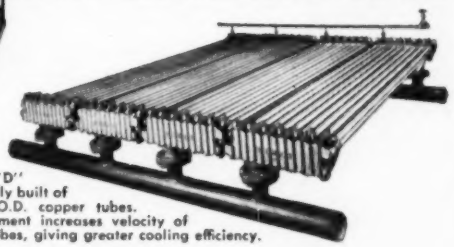
The Kumler Company was organized in 1946 as a manufacturers' representative in Tulsa, by H. H. (Hub) Kumler. Mr. Kumler is a graduate of Ohio State University with a degree in petroleum engineering. He has been with the Farvel Corporation and Cleveland Worm and Gear Company, Cleveland, Ohio.

Cooper-Bessemer Salesman

The Cooper-Bessemer Corporation has just announced the appointment of Walter H. Kraemer to its field sales and service office in San Francisco, California.

A graduate of Purdue University in 1943, Mr. Kraemer holds a Bachelor of Science degree in Mechanical Engineering. Since graduation he has been associated with Cooper-Bessemer where he has been actively engaged in this diesel builder's sales efforts. Mr. Kraemer has also been associated with Cooper-Bessemer's recent development of new nodular iron, working directly under T. E. Eagan, Cooper-Bessemer Chief Metallurgist, and L. F. Williams, Assistant to the President, who has been directing the program.

BINKS evaporative closed-type
HEAT EXCHANGE COILS



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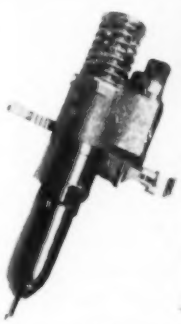

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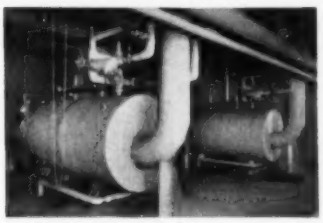

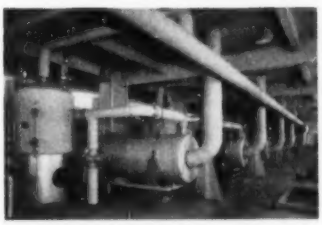

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This outstanding installation highlights the practicality of Maxim Heat Recovery Silencers. Here is efficient use of waste exhaust heat that would otherwise just go "up the flue" to the outside atmosphere. The extra fuel cost for this usable heat is zero because the only fuel involved is that normally used for engine operations.

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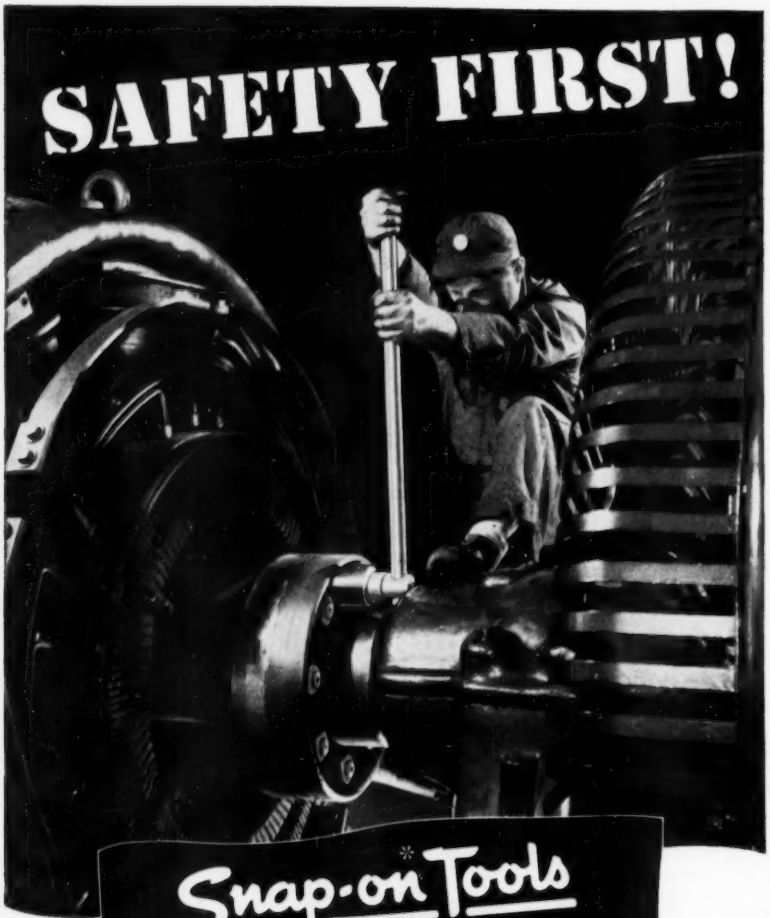

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On this job, as you can see, there's no room for the head of a ratchet wrench, nor is there either jaw-room or handle-clearance for an open-end wrench. But a Snap-on L-53 Sliding Bar does the trick, with a safe, sure, snug fit and an easy half-turn-at-a-time action, without once disturbing the grip of the socket.

Ten to one, there are maintenance or overhaul jobs just as time-wasting, potentially, as this in your plant. And the odds are still better that there are many Snap-on Tools that would swiftly pay for themselves. Here Snap-on's nation-wide tool service can be mighty helpful!

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Filters Catching On

It is estimated that the oil filter industry achieved an all-time high sales volume of more than $60,000,000 in 1950, according to Carlos D. Kelly, vice president in charge of sales of Purolator Products, Inc., of Rahway, N. J. This compares with sales totalling approximately $45,000,000 in 1949.

The steady increase in sales of oil filters and refills, Mr. Kelly said, showed that leading manufacturers in the industry were succeeding in their efforts to educate the public, through increased advertising, of the need for an oil filter and periodic changes of the filter element to prolong the life and operating efficiency of their engines.

"The net increase in the vehicle population over the past year," according to Mr. Kelly, "was 8½ per cent. On the other hand, sales of oil filters and elements showed an increase of at least 33 1/3 per cent, a striking indication of the results obtained by the industry through its aggressive advertising efforts."

Looking ahead, Mr. Kelly estimated that sales of the oil filter industry in the coming year probably will show a further increase of at least 20 per cent if the necessary raw materials for their manufacture continue available.

Annual DEMA Meeting Productive

During the recent three day Annual Meeting of the Diesel Engine Manufacturers Association, the following were some of the topics discussed: Revision of the Association's 1946 edition of "Standard Practices for Low and Medium Speed Stationary Diesel Engines", for publication in 1951; the need for a universal single cylinder test engine for mechanical engineering schools; the Association's Educational program; the work of the ASTM Sectional Committee Z11 on Petroleum Products and Lubricants; and The Texas Company's research work on crankcase explosions.

Panel discussions were held on the subjects of diesel fuel and diesel lubricating oil and on diesel engine gover-

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The controlled rotary turbulence set up by the Lanova System gives a Diesel these outstanding advantages

- High combustion efficiencies
- Smooth, powerful thrust of working pressures on the pistons
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nors, with representatives of the research divisions of the oil companies and representatives of the governor manufacturing companies participating. Panels were also held on the subjects of diesel engine filters and on diesel engine cooling, with the chief engineers of the diesel engine manufacturers participating. Presiding over these four panels were Ralph L. Boyer, vice-president and chief engineer of the Cooper-Bessemer Corporation, Ervin L. Dahlund, chief engineer, diesel division of Fairbanks, Morse & Co., John H. Sheusner, chief engineer, Enterprise Division of General Metals Corporation, and George Steven, executive engineer of Worthington Pump and Machinery Corporation, respectively.

At a dinner meeting, Harlan W. Nelson, supervisor of Fuels Research at Battele Memorial Institute, and Elmer R. Kaiser, assistant director of Research for Bituminous Coal Research, Inc., gave a report on the status of the project being carried on at Battelle Memorial Institute for improving gas producers using bituminous coal, which project is under the joint sponsorship of certain members of DEMA and a number of other interested organizations.

The highlight of the annual meeting luncheon was a talk by Mr. John L. McCaffrey, president of International Harvester Company, on "Selling Your Company to Your Employes."

DEMA Symposiums

Two symposiums sponsored by the Diesel Engine Manufacturers Association were held recently, one at the Baldwin-Lima-Hamilton Corporation,

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½ to 40,000 HP
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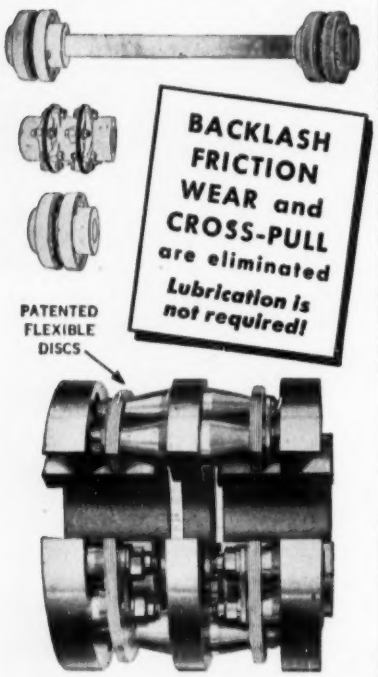

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Eddystone, Pa., and the other at the Cooper-Bessemer plant at Mt. Vernon, Ohio. The two conferences were part of the continuing program sponsored by DEMA which aims at familiarizing educators with diesel engines.

At the Baldwin-Lima Conference, C. F. Pervier, Manager, Diesel Engine Engineering, spoke on the long period now required to train engineering graduates for diesel engineering design and recommended that universities give more attention to certain practical problems facing the industry today. The maintenance problem for diesel locomotives was discussed by R. P. Johnson, General Manager, Service Department of Baldwin-Lima. Among others who addressed the group were Harvey T. Hill, executive director of DEMA and R. L. Stanley, educational director of the society.

The Cooper-Bessemer Conference featured several talks on various subjects by personnel of the firm. Some of the subjects and speakers, all of whom were C-B men, were:

"Recent Developments in the Use of Natural Gas as a Source of Power" by W. A. Crooks, Resident Engineer.

"Diesel Locomotives" by E. L. Miller, Locomotive Diesel Division.

"Recent Developments in Gray Iron" by T. E. Eagan, Chief Metallurgist.

"Preventive Maintenance" by J. H. Caldwell, Field Service Engineer.

This conference also included a tour of the Cooper-Bessemer plant which demonstrated to those attending the advanced production practices used today in the manufacture of diesel equipment.

Organizational News

Cummins Appointment

Charles J. Wilhite, who started with Cummins in 1939, has been promoted to acting northwest regional manager of Cummins Engine Company, Inc. His headquarters will be 809-810 Security Building, Seattle, Wash.

After three years on shop assignments at the factory, Wilhite served four years, 1942-1946, with the U.S. Army Corps of Engineers. He was transferred to the Cummins Service Department soon after his return from the Army and in 1948 was appointed northwest regional service representative.

Ralph J. Shields, a Navy veteran, 1942-1945, who has been with the Cummins organization for the last four years, has been appointed to Wilhite's previous position of northwest regional service representative. Shields has been a factory field service representative with headquarters at Columbus since May, 1949.

Enterprise Appointment

P. B. "Pete" Erwin has been appointed district manager of the Los Angeles branch office of Enterprise Engine & Machinery Co.

Long identified with the Southern California oil industry, Erwin served with Bethlehem Supply Co. of California for twelve years, where he was manager of machinery sales. Prior to that he was with Union Oil Company in the Los Angeles area as superintendent of power maintenance.

In his new capacity as district manager, Erwin's primary activities will be in oil field, pipe line and stationary engine sales. This addition to Enterprise's field staff is consistent with the company's program of engine sales and service expansion.

Weston Representative

Earl R. Mellen, president of Weston Electrical Instrument Corporation, has announced the appointment of Thomas H. Closs as sales representative of Weston for northeastern and eastern Maryland. Mr. Closs will maintain his offices in metropolitan Baltimore at 17 West Pennsylvania Avenue, Towson 4, Maryland.

Mr. Closs joined the New York office of Weston in 1941, where he remained up to his new appointment. Prior to 1941, he was sales engineer representing the Weston organization in Rochester, N. Y., for a number of years.

Laminated Shim Appointment

Otto Hecht has been named Production Manager of the Laminated Shim Company. His responsibility will include supervision of the manufacture

of the company's general stampings, custom shims, packaged shim stock and *An-Cor-Lox* lock nuts.

Mr. Hecht has been with Laminated Shim for 16 years. After starting in the shop itself as a press operator, he was promoted to the sales department after the war. His experience was further rounded out with time study work and the last year has been spent as methods engineer.

Link-Belt Ad Manager

Link-Belt Company has appointed Bertram V. Jones advertising manager to succeed Julius S. Holl, deceased. Mr. John F. Kelly will continue in the capacity of asst. advertising manager.

Mr. Jones joined the Link-Belt advertising department in Chicago in January, 1923, after having done advertising work for several other companies.

Mack Bronx Manager

W. A. Brady has been appointed manager of the Bronx branch of Mack-International Motor Truck Corp.

Mr. Brady joined Mack in 1936 as a salesman at the company's Brooklyn branch. He was appointed manager of Mack's White Plains Branch in 1949, and later was assistant district manager of the company's New York City branch.

Double Seal Representatives

Three new sales representatives have been appointed by Double Seal Ring Company of Fort Worth, Tex., according to an announcement by Buyrl Wilson, general sales manager.

Two are individuals, and the third is a firm with two principals. The new sales representatives and their territories are: Alton J. Fabrey—eastern part of the state of New York; Clifford J. Lane—western part of the state of New York; and the C. H. Garrison Company, headed by C. H. Garrison and Mel Silberman—the state of Kansas and southwestern Missouri. All four men concerned have had extensive experience in practical and sales engineering.

I-H Appointment

Mr. W. W. Black has recently been appointed chief engineer, Field Engineering Section in International Harvester's industrial government products group. In his new duties he will direct and coordinate all the activities related to the training of operators and service men for specialized government vehicles produced by the industrial power division. During World War II Mr. Black had experience with a similar program.

While on this assignment, Mr. Black has been transferred for an indefinite period from the industrial service section which he originally organized and headed. His duties as general supervisor of service, industrial, will be carried on by Mr. F. J. Schreck, the assistant supervisor.

Koppers Names Chief Engineer

John W. Pennington, former staff engineer for the Caterpillar Tractor Company, has been named chief engineer of the Piston Ring Department of Koppers Company, Inc., according to Walter F. Perkins, vice president and general manager of Koppers Metal Products Division.

Mr. Pennington will be responsible for the design and metallurgy of Koppers American Hammered Piston Rings; all shop and field testing; supervision of research activities; and customer contacts of an engineering nature.

Mr. Pennington was associated with Caterpillar Tractor, Peoria, Ill., since leaving college, first as a student engineer, and from 1941 to 1946 as a research engineer specializing on internal combustion engines. He was staff engineer since 1946, responsible for research programs on pistons, piston rings, cylinder liners, and bearings.

Alco Changes

William A. Callison, vice president of American Locomotive Company in charge of western regional sales, has been assigned charge of eastern regional sales, it was announced by W. S. Morris, vice president in charge of sales for the company.

Appointment of William F. Lewis, district sales manager at St. Louis, Mo., as a vice president of the company also was announced. Mr. Lewis

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1. Centrifugal rebabbitting of all sizes of bearings.*
2. Repair and service on Woodward Governors.
3. Repair and service on all types of fuel injection equipment.
4. Repair and service on all types of centrifuges.
5. Fully equipped machine shop for repairs and manufacture of parts.
6. Large stock of spare parts on hand.

*Patents pending

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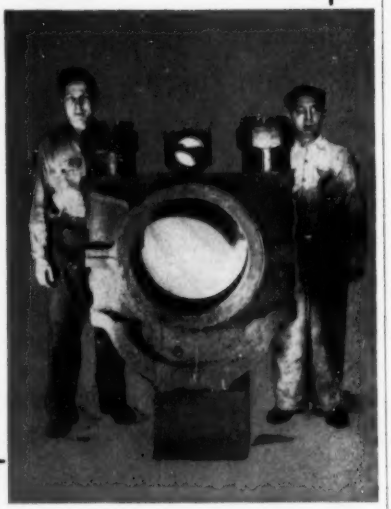

has been assigned charge of western regional sales.

The company also announced that Stephen G. Harwood, formerly district sales manager in New York, has been appointed sales manager of Montreal Locomotive Works, Limited, Alco's Canadian affiliate.

All assignments were effective December 1. Mr. Callison will make his headquarters in New York, and Mr. Lewis will transfer his office to Chicago.

Young Appointment

Appointment of Otto A. Bossart as sales and engineering representative for the Contract Products Division of the Young Radiator Company has been announced by John J. Hilt, vice-president.

Mr. Bossart is a graduate of the University of Wisconsin with a BS degree in Mechanical Engineering. He has been a member of the Milwaukee Chapter of the Society of Automotive Engineers since 1941. Long familiarity in the radiator business will stand Mr. Bossart in good stead for his new duties of important character with the Young Radiator Company.

ABOE Executive Change

Bosworth E. Monck, A.M.I. Mech. E., has been named executive vice president of ABOE, Inc., New York, the American branch of Associated British Oil Engines, Ltd., London. He succeeds Ronimund Bissing, who recently resigned the presidency which he had held since the company's formation in October of 1949. Mr. Bissing remains with the company as a director.

Bosworth E. Monck

Mr. Monck, a qualified diesel engine specialist, has been connected with the London company since the early days of World War II. He is a director of the British company and will retain that position.

Since the war Monck has specialized in market development with major emphasis on sales engineering cooperation with distributive outlets.

Nat'l Supply Branch Manager

Announcement has been made of the appointment of Ralph S. Lorimer as branch manager of The National Supply Company's new Washington, D. C. office.

Mr. Lorimer brings to National Supply a background in diesel engineering which dates back to 1917, the year he joined the Atlas Imperial Diesel Engine Company of which his father was one of the founders. He has been engaged in almost every phase of diesel engine manufacturing, including development work, field engineering, production, sales, and was, immediately prior to joining National Supply, in charge of the Lorimer Diesel Engine Company of the Atlas Imperial organization.

Federal-Mogul Promotion

Advancement of Walter E. Thill to assistant chief engineer is announced by H. F. Dixon, chief engineer of Federal-Mogul Corporation, Detroit. Thill has been employed by Federal-Mogul since 1938 in various engineering capacities. For the past three years he has directed field engineering for Federal-Mogul Service, and is known to automotive maintenance men throughout the country for his educational activities, including supervision of field service meetings, analysis of field performance of engine bearings, lecturing at universities and trade schools, and publication of technical papers on engine bearing maintenace.

Thill, a graduate of the University

of Detroit's School of Engineering, is a registered mechanical engineer in Michigan. He is an active member of S.A.E. and participates in activities of other engineering societies.

American-Bosch Election

Foster N. Perry has been elected executive vice-president of the American Bosch Corporation. Mr. Perry has been vice-president of the Corporation for the past ten years during which period he has been in charge of manufacturers sales.

Educated at Choate School, Haverford College and the Massachusetts Institute of Technology, he commenced his business career in the production division of American Bosch

Foster N. Perry

in 1924 and has been continuously associated with the organization ever since, for the most part in field engineering and sales capacities.

Hamilton Division Appointment

George H. Lynn has been appointed general sales manager of the Hamilton Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio. In his new capacity he will be in charge of sales of machine tools, can machinery, diesel engines, and special equipment, with offices in Hamilton.

Mr. Lynn, a graduate engineer, joined Lima-Hamilton Corporation in 1947 as Western district manager in Chicago for Niles Tool Works Division, and Hooven, Owens, Rentschler Division of the company. He held this position until taking over his new appointment in the Hamilton Division.

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Cooper-Bessemer VP

Charles G. Cooper, manager of Cooper-Bessemer's Washington office, was elected a vice president at the recent Board of Directors' meeting.

Charles G. Cooper

Elected a director of the company in 1945, Mr. Cooper has been responsible for the sales and servicing of government diesel and gas engine contracts, as well as all direct relations between Cooper-Bessmer and agencies of the U. S. government.

Mr. Cooper is a graduate of the Sheffield Scientific School of Yale university, 1926. He served as a field and service engineer with the Chapman Stein Company, former Cooper-Bessemer subsidiary, until 1931 when he joined Cooper-Bessemer's New York office as sales engineer. In 1933, Mr. Cooper established the Washington office that he has managed ever since.

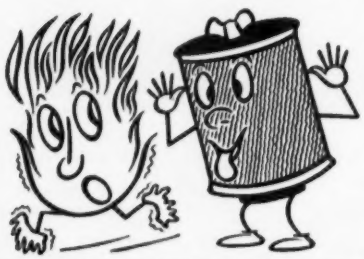
Compressor Authority at Cooper-Bessemer

Cooper-Bessemer recently revealed that for several months John Fulleman, recognized authority on engine supercharging and centrifugal compressor design, has been at work with the company's engineering staff. His job is to coordinate a broad engine de-

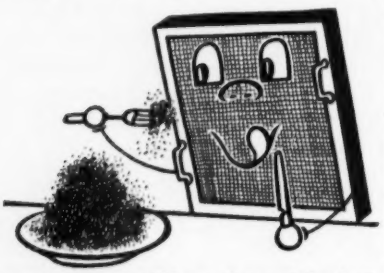
AIR-MAZING FACTS

BY O. SOGLOW

FEEL A DRAFT? In order for air in motion to be called a draft it has to be moving at a speed of at least 3.5 feet per second. Authorities say that the average person can't detect air in motion unless it's moving that fast.



GIVE FLAMES COLD FEET! Air-Maze approved flame arresters keep sparks, flame and dirt out of tanks used for storing inflammable liquids. Another of the many filter types designed by Air-Maze, the filter engineers.



DIRT'S ITS DISH! Airborne dust and dirt don't get very far with Air-Maze filters on the job. Air-Maze filters provide clean air for ventilation systems, keep damaging dust out of engines, compressors, blowers, electronic equipment, motor generator rooms, etc. All-metal, cleanable, high dirt-holding capacity.

WHETHER YOU BUILD OR USE engines, compressors, air-conditioning and ventilating equipment, or *any device using air or liquids* —the chances are there is an Air-Maze *engineered* filter to serve you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 5, Ohio.

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AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
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veolpment program now under way at its Mt. Vernon headquarters plant.

Mr. Ralph L. Boyer, vice president and chief engineer of Cooper-Bessemer, explained that the purpose in retaining Mr. Fulleman was two-fold. Future requirements for greater economy of operation and higher horsepower per pound in gas and diesel engines calls for acceleration of their program of research and development in supercharging; and secondly, builders of engines for driving centrifugal compressors should have on its staff an authority on the mechanics and economies of this type of compressor operation.

Mr. Fulleman, born and educated in Switzerland, previously served as field representative for the Swiss firm of Buchi adapting their turbochargers to American built engines.

Advertisement

Interested in Export

This picture was originally printed in these pages with an article describing what is probably the world's highest diesel power house in Peru, S. A. Mr. Land, who installed the engines, again writes us:

"I would like to get in touch with a contractor who needs a mechanical superintendent for a foreign project, or a manufacturer who needs capable representation in export territory. Having spent many years in the Near East — India — Austrialia — most of South America, and familiar with Central America and speaking fluent Spanish, I can offer unusual ability in the export field."

Mr. Land assures us that he no longer wears his facial foliage, and any company desirous of further information as to his technical and executive background is asked to write, wire or phone Jim Land, 2221 8th Ave. W., Bradenton, Fla.

John Avery

John Avery, president of Roots-Connersville Blower Corp. since 1946, died of a heart attack on January 13th. Mr. Avery was a native of Boston and graduated from the U.S. Naval Academy with the class of 1923. His first industrial experience was with the engineering staff of General Electric.

In 1926, he became a project engineer for Brown-Boveri Company of Switzerland and from 1932 until joining Roots-Connersville, he was connected with Allis-Chalmers Manufacturing Co. in Milwaukee. Mr. Avery was active in atomic development work during World War II and received the Kellex Key for outstanding service. His experience was extensive in the blower and compressor field.

Mr. Avery was a member of the executive board of the Machinery & Allied Products Institute and a director of the Compressed Air & Gas Institute, with headquarters in Chicago and New York respectively.

Henry Sutphen

Henry R. Sutphen, since 1947 chairman of the executive committee of the Electric Boat Company, with which he had been associated since 1892, died in December at the age of 75.

The Board of Directors of DEMA adopted the following resolution in memory of Mr. Sutphen:

"Resolved that we, the Directors of the Diesel Engine Manufacturers Association, having learned with profound sorrow of the death on December 10, 1950, of Henry Randolph Sutphen, desire to pay tribute to his memory, to his manifold labors in the service of his Country and of this Association, and to the unique place that he holds in the hearts of all who were privileged to know him.

Henry Sutphen was associated throughout his business life with Electric Boat Company, one of the pioneers in the development of the diesel engine in the United States, with particular reference to its application to submarine propulsion. At the time of his death he was chairman of the executive committee of that company. He was outstanding among shipbuilders for the introduction of standardization to the building of pleasure craft, for the

production of Motor Torpedo Boats and the mass fabrication of steel merchant ships during World War I, and for the development and mass productoin of PT boats in World War II.

He was one of the founders of the Diesel Engine Manufacturers Association and our first President, and he contributed actively of his wisdom and experience to the work of the Association from the date of its establishment. But beyond this, by his superior qualities of personality, mind and character, he earned the esteem and affection of his colleagues and of all others who were privileged to be associated with him. He will live long in the hearts of his friends and colleagues. We deeply regret his passing and extend to his family our deepest sympathy in their bereavement.

Further Resolved that as an enduring record of our affection and regard for Mr. Sutphen, these resolutions be spread in full upon a separate page of the minutes of this meeting and that a suitable copy thereof be conveyed to his family."

Portable Power

(Concluded from page 34)

and fused switches that control leads to the lights, compressor motors and the radiator motors. Safety features include insulating flooring on both sides of the panel and the use of insulating material above and around the switchgear.

All wire, cable, pipe and fittings and flexible connections are supplied so that it is only necessary to connect the components and fill the systems with cooling water, lube and fuel oil, to operate the unit. The main power cable supplied is of the 5-kw. trench-lay type so that conduits are not required.

General

Application and value of this type equipment for military use needs no amplification; its potentialities are apparent. Its use for utilities, municipalities and industries, either on an emergency or permanent basis, is equally plain upon a little reflection.

One typical example is the case where a utility or municipality has a load out near the end of a long transmission line. This equipment would be well suited to be set up at the end of such a line not only to be available in case of failure of the main power source, but during non-recurring or seasonal peaks to avoid expensive transmission line costs.

Aside from functional use, these units offer inherent advantages including speed of installation with no major foundation construction costs or problems; minimum disruption of any existing plant; ease of maintenance and repair; and the possibility of high resale value when used on a temporary basis. On a permanent basis there is the added advantage of having a completely engineered installation without the necessity for selection and procurement of proper accessories and the difficulties frequently attendant to construction and installation.

PIONEERS IN DIESEL TESTING EQUIPMENT

For Additional Information Write

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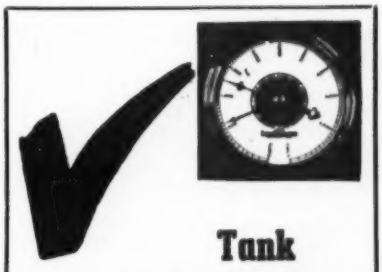
Portland 14, Oregon



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With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No Diesel plant is complete without one. Liquidometer or Levelometer models are available for tanks of any capacity.

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We have a number of alert young men who have completed intensive training in Diesel Mechanics. They learned their trades thoroughly by working on actual equipment under personal, expert supervision. If you need a trained man, we invite you to write for an outline of our course, and for a prospectus of the graduate. No fees, of course. Address:

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Complete Line Now Available
From ½" Pipe Size To 6" Pipe Size

Regulates engine jacket water or lubricating oil temperature automatically.

Cold engines are inefficient and good hand regulation is impossible. "Amot" thermostats are simple, reliable and low priced.

"Amot" thermostats were designed expressly for engine use and are entirely self-contained with no external lines or bulbs. No adjustments or servicing are ever required. All models are of the by-pass type with positive 3-way valve action. Insensitive to pressure variations.

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Zalea Bros ..... 3rd Cover

Zallea Expansion Joint News

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Expansion Joint of the Month

GAS TRANSPORTER USES ZALLEA

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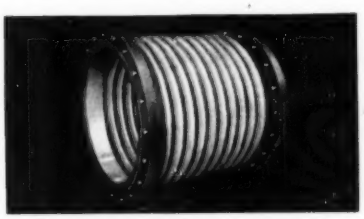
Tremendous stamina is a must in flexible connectors for modern Diesels . . . and ZALLEA Flexible Connectors "have what it takes". That's why more engineers choose ZALLEA over any other make. Construction is simplified . . . flexibility has been achieved at no sacrifice of durability . . . maintenance is eliminated . . . no seams or joints to open. And ZALLEA Flexible Connectors, engineered with annular corrugations, eliminate torsional strains so common to spiral or helical types of connectors. Because



of their great axial and lateral movement, bends may be made to a minimum radius of as little as $1\frac{1}{2}$ times the diameter. ZALLEA Flexible Connectors are available in diameters from 4″ to 72″ with flanged or welding ends or a combination of both. Made of stainless steel to handle exhaust temperatures up to 1600° F.

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Our Readers Ask

Q. *We installed (censored) expansion joints in our pipe lines. Two failed at the weld. What is being done industry-wise to overcome this condition? G. S. Thomas, Grand Rapids, Michigan.*

A. We here at Zallea have been well aware of this general condition for many years, Mr. Thomas. And we did something about it. Accelerated flexing tests of corrugated bellows proved that the resultant welding bead of a shielded arc weld was detrimental to the life of the bellows because failure always occurred across the weld—thickest section of the bellows. We found that by adopting an *exclusive* variation of the Heliarc process and adding a grain refining procedure to the finished weld, we could produce a corrugated bellows that under extreme flexing tests *failed in the parent metal only.* After hundreds of tests made with Zallea *controlled* welding, not one failure occurred within 30 degrees of the weld line. More important was the fact that these bellows lasted four to eight times longer than bellows having a shielded arc welding bead.

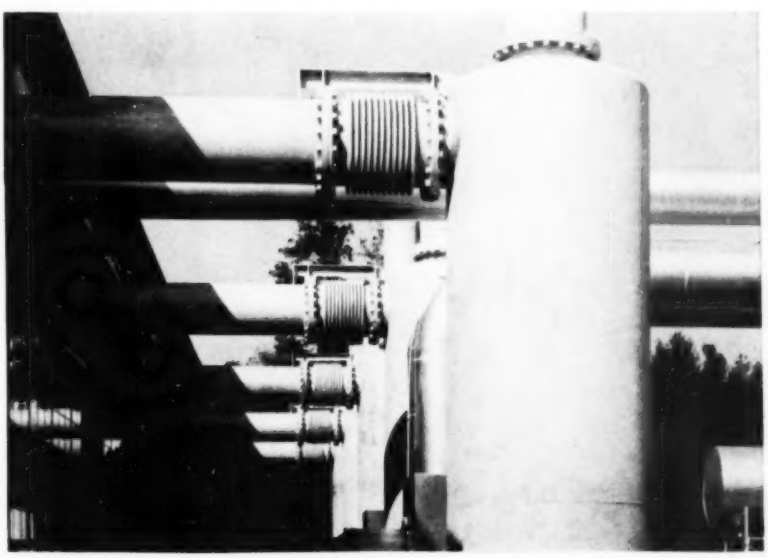
29 Flexible Connectors Installed on Diesel Exhaust Lines

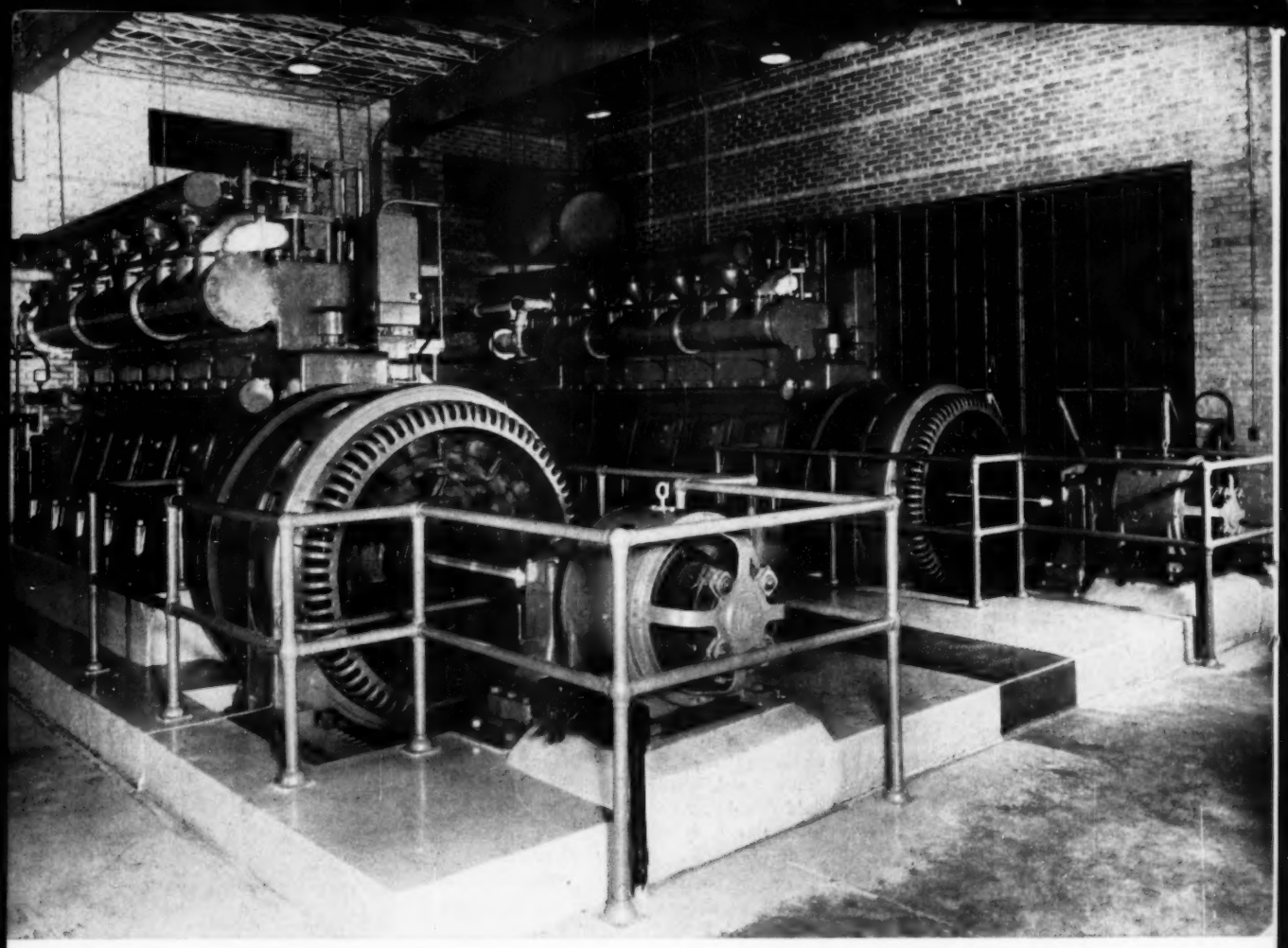
Shown here are five 24″ diameter Zallea Type 347 Stainless Steel Flexible Connectors installed on the Diesel exhaust lines at a compressor station along one of the nation's largest natural gas transmission lines. Five modern, well-equipped compressor stations in the system depend on 29 Zallea Stainless Steel Flexible Connectors for assurance of dependable performance and uninterrupted service.

Absorb Lateral and Axial Movement

Here, as in thousands of installations throughout industry, Zallea Stainless Steel Flexible Connectors are built to absorb *both* lateral and axial movement. They are extremely flexible and long-lasting because of their design, having a true bellows form. Hydraulically formed and with uniform wall thickness, all corrugations are annular and parallel, with the axis perpendicular to the centerline of the connector.

All Zallea Stainless Steel Flexible Connectors are formed from tubes having a single longitudinal weld to provide for longer service life. They are permanently gas-tight and require no packing.





Puts the finger on ring troubles . . .

●Operators of a midwest rural power station found themselves running into serious maintenance troubles. In their two Worthington Diesel engines, rings were sticking and blow-by was fouling crankcases. They decided to discuss the problem with a Standard Oil lubrication specialist.

STANDARD HD
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Diesel Oil

He advised them to switch the units from the conventional lubricant being used to STANDARD HD Diesel Oil. Tougher operating conditions, he explained, called for the use of a lubricant having high oxidation resistance and excellent detergent qualities.

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